Repertorium specierum novarum
regni vegetabilis.
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# A CONTRIBUTION TO THE KNOWLEDGE OF THE FLORA AND VEGETATION OF TURKEY

BY

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With 39 Plates and 2 Maps

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*DEDICATED TO THE MEMORY*

*OF*

*MY HUSBAND*

# Preface.

In the year 1925 I had the opportunity of visiting twice some parts of Turkey. The first time, in January and February, I accompanied my husband — the late Prof. Henry Czeczott of the Mining Academy in Cracow — on a short excursion. With the purpose of studying problems of mining and industry, we visited the vicinities of Constantinople and part of Bithynia — namely the southern part of the mountain massif situated between the lower courses of the Sakaria and Milan-Chai rivers, our headquarters being at the small town of Hendek, a well-known centre of the tobacco industry. We stayed there from February 1st to 14th, and I was able to observe in the Cham-Dagh mountains the simultaneous winter and spring aspect of the vegetation. A more prolonged stay in Constantinople (27. XII.—31. I. and 15. II.—27. II.) which is surely the most beautiful city in Europe, enabled us to become acquainted with the early spring flora of the Mediterranean type. A day's excursion was made to San Stefano and another to Prinkipo (Princes Isles), and we went several times to Sari-Yar and Rumeli-Kavak — two small villages situated on the northern shore of the Bosporus near its outlet to the Black Sea. (See Map 2.)

The second time, during an expedition which lasted from July 9th to August 16th, we visited some of the same localities near Constantinople (Sari-Yar and Rumeli-Kavak) and near Hendek, as well as the pretty valley near the Circassian village of Bichki-Dere, in the western part of the mountain chains of Kurmaly-Dagh (a day's stay). After a journey from Ada-Bazar to Ankara by railway, we stayed seven days in Ankara, and then entered upon the most interesting stage of our journey —the crossing of Northern Anatolia from Ankara to Ineboli — making several side-excursions, as, for example, from Changri to Arab and to Tukht (see Map 2), and from Kastamuni to Tasköprü and thence to the mountains forming the watershed between that town and Sinope: in the imposing mountain-chain of Ilgaz-Dagh (Olgassys) the small village of Yailajik was chosen as our headquarters for several days, whence excursions were made to the summit of Büyük-Ilgaz and Kush-Kayasy. A several days' stay was arranged at Edjevid and Küre in Northern Paphlagonia, and a compulsory longer stay at Ineboli. On our

return to Constantinople the steamer stopped for several hours at Zunguldak, and this short time was likewise spent in scientific researches.

When travelling across Northern Anatolia we were able to observe the transition from the steppe vegetation of the interior of Anatolia (which besides steppes bears also other xeromorphic communities: such as pine-woods and shrub-oak communities) to the forest vegetation of northernmost Paphlagonia. The forest zone in the Ilgaz-Dagh chain consists chiefly of coniferous forests (*Abies*, *Pinus*), but after a steppe-covered gap in the plains through which flows the river Geuk-Irmak the forest returns again, this time in a more mesophytic aspect of mixed forests of a very rich composition, in which *Fagus* and *Taxus* play an important part. — In the last stage of this journey we were able to witness the most interesting transition from the forest vegetation to the evergreen Mediterranean vegetation. Near Zunguldak macchie — in their most splendid appearance — were observed.

The expedition — this time a party of five (besides my husband and myself, Prof. V. Nikitin, the well-known Russian mineralogist, and his assistant, the late J. Zawadzki, student of the Mining Academy in Cracow, and our interpreter, a Tartar man, named Murat-Aziz, who was at the same time our cook) — again had mining researches as its main object. This fact and limited time did not permit me to explore with the same minuteness all the plant communities and the different zones of vegetation. The alpine vegetation remains the least known.

Still — if during our five weeks' wanderings in Anatolia and two weeks' stay near Constantinople I succeeded in collecting and well drying about 1000 numbers of plants, if but in a small degree I have been successful in catching the vivid aspect and charm of the Anatolian landscape and reproducing it in photographs, which serve here as illustrations, if some of the problems concerning the flora and vegetation of Turkey, hitherto quite obscure, have become a little less so, if others have now arisen as entirely new problems, — I have to thank the leader of the expedition, the late regretted Professor Henry Czeczott, who, besides being a prominent mining engineer and professor, was also a great lover of nature and an experienced traveller. He helped me not only in photographing landscapes and labelling plants, but also by sacrificing several days of the very scanty and precious time of the expedition and enabling me to make the ascent of some alpine summits, where alone the high-mountain vegetation could be studied and unlimited views of the low-lying plains and highlands be admired. To His memory this work is dedicated.

The plants collected during my two journeys in Turkey number 581 species, varieties, and forms of Phanerogams, and 61 of Cryptogams, in all 1020 specimens. Of these 27 have been described as new species or subspecies, 19 as new varieties and forms; two new combinations have been made. The small number of varieties and forms in relation to new species is accounted for by my small experience in systematic work when I started upon the identification of my Turkish plants, they are certainly more numerous than is indicated in my list.

During the work of determination the want of a herbarium with oriental plants and of the appropriate literature in Poland was sorely felt. I was obliged to spend several months working in the museums of Geneva, Kew, London, Paris, Vienna, Leningrad, Berlin, and Brno. If almost the entire collection has been determined it is only owing to the help of my specialist colleagues. Critical genera have been wholly or partly determined: *Hieracium* by Prof. Zahn, *Rosa* by Prof. R. Keller, *Centaurea* — partly by the late Dr. Hayek, *Festuca* by Mr. St.-Yeaves, *Usnea* by Dr. J. Motyka and so on. Much valuable time has been given to me by the late Dr. John Briquet, Dr. G. Beauverd (Geneva), Dr. H. Handel-Mazzetti (Vienna), Prof. B. A. Fedczenko (Leningrad) and many others, to whom I herewith express my gratitude. I would specially mention Prof. W. Szafer (Cracow) and Prof. B. Hryniewiecki (Warsaw), to whom I am much indebted for constant help, advice and criticism, and Dr. J. Lilpop (Cracow), who has given valuable assistance in the work of photographing the new species. I am deeply grateful to Dr. W. B. Turrill (Kew), who kindly read and improved the English in both parts of the present work, and to the late Prof. J. Czubek (Cracow) for helping me with the Latin.

I feel it my pleasant duty to tender my best thanks to the Ministry of War and the Ministry of Education. The former, by covering the expenses of my journey to Turkey, enabled me to accompany my husband, Prof. Henry Czeczott, and thus to gather a very valuable collection. The latter likewise granted financial assistance during my last three journeys abroad for the purpose of completing the study of my collection.

HANNA CZECZOTT.

Kraków, September, 1930.

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## CORRECTIONS AND ADDITIONS.

Page 17, Table II, Footnote 5, does not apply to *Peltigera horizontalis,* but to *Lobaria linita* (observation No. 13).
„ 17, line 5 from bottom. For "stronger" read "strong".
„ 18, line 13. For "inpenetrable" read "impenetrable".
„ 35, line 13 from bottom. For "seems" read "seem".
„ 47, line 7. For "chosing" read "choosing".
„ 47, line 9 from bottom. After "Nowack" insert "and a chapter in Leonhard's 'Paphlagonia', in which the distribution of forests and other formations in connection with climate are spoken of (42, p. 208 to 223)".
„ 47, line 10 from bottom. For "(45, 46)" read ("45, 55).
„ 55, bottom line. Transpose "by" and "arranged".
„ 59, line 6 from bottom. For "1620" read "1650".
„ 61, line 5. For "*speciosae*" read "*speciosi*".
„ 62, line 7. For "*multicaulis*" read "*multicaule*".
„ 65, line 2 from bottom. For "paseers-by" read "passers-by".
„ 71, line 19. For "*O. paphlagonicum*" read "*O. Briquetii*".
„ 73, line 8 from bottom. For "*O. paphlagonicum*" read "*O. Briquetii*".
„ 74, line 10. For "1524" read "1465".
„ 80, line 3 from bottom. For "appears" read "appear".
„ 82, line 15 from bottom. Cancel "of".
„ 82, line 12 from bottom. For "mnts" read "mts".
„ 83, line 5. For "mnts" read "mts".
„ 84, line 12. For "tundra" read "taiga".
„ 86, line 1. For "score" read "scores".
„ 91, line 2. For "*Onosma paphlagonicum*" read "*Onosma Briquetii*".
„ 92, line 14 from bottom. For "*Saxifraga Hueliana*" read "*Saxifraga cymbalaria*".
„ 92, bottom line. For "*Alectoria prolifera*" read "*Alectoria jubata* var. *prolixa*".
„ 93, line 3 from bottom. For "p. 74" read "p. 92".
„ 100, line 19 from bottom. After "much" insert "more".
„ 105, line 15 from bottom. For "repeared" read "repaired".
„ 108, line 1. For "ower" read "lower".
„ 109, line 1 and line 11 from bottom. For "lichenes" read "lichens".
„ 112, line 3 from bottom. For "Kusz-Tepe" read "Kush-Tepe".
„ 112, line 3 from bottom. For "1372" read "1350".
„ 123, line 19 from bottom. For "Ali-Riza-Rey" read "Ali-Riza-Bey".
„ 124, line 20. For "is" read "are".
„ 128, line 3. For "Dusjc" read "Duzje".
„ 135, line 6 from bottom. For "grave-yards" read "graveyards".
Plate XV, phot. 29. For "2200" read "2400".

# PART I

# A DESCRIPTION OF THE VEGETATION OF PARTS OF BITHYNIA, GALATIA, AND PAPHLAGONIA, AND OF THE VICINITIES OF CONSTANTINOPLE.

# Bithynia[1].

This paper might have started with a description of the vegetation of the vicinities of Constantinople, which represent typical East-Mediterranean macchie and light forests, but as our Anatolian wanderings reached their end on the shores of the Black Sea — likewise covered with macchie — I preferred to bring the two together in the last chapter. We shall, therefore, begin with the vegetation of Bithynia.

**From Constantinople to Ada Bazar and Hendek.** The most convenient way to reach the town of Hendek from Constantinople is to take the express train Constantinople—Ankara, which takes $6^1/_2$ hours to reach Ada-Bazar. Thence one is obliged to continue the journey with horses along the old road leading to Bolu. The 25 km from Ada-Bazar to Hendek take up a longer or shorter time according to the season of the year.

Many prominent travellers and botanists have followed this road (Aucher-Eloy, Tchihatcheff, Wiedemann and others) but passed farther on, most probably because they saw the destroyed vegetation of the nearest environs of Hendek: the wide tracts covered with tobacco-plantations and corn-fields, with many fruit-trees on the balks, could give no idea of what a wonderful land of luxuriant vegetation is hidden in the deep valleys of the near mountain-massif, the Cham-Dagh. The nearest parts of Asia Minor in which botanical collecting has been done are the surroundings of Lake Sabanja to the west (Wiedemann, Warburg, Endriss) and Bolu and Safaranboli to the east (Wiedemann, Pestalozza).

The Cham-Dagh mountains, as has already been stated, were visited by me twice during the year 1925. The first time my husband and I spent two weeks (from 1. I. to 15. II) at Hendek — our headquarters; the second time, with a more numerous company, we visited the same place, camping right in the mountains for a week (from 23. VI. to 30. VI.).

[1]) While the manuscript was awaiting publication since 1930, the transcription of the geographical names used throughout this work has become antiquated. Although I am aware that the transcription ought to be changed in accordance with the orthography now used in Turkey, I gave up the idea of doing so because this would require too many corrections in the text and maps.

The collection of plants made during the first excursion was, of course, not very rich on account of the season of the year. In the deep latitudinal valleys or those open to the east it was still winter: the presence of the snow-cover, though thin, was in strange contrast with the evergreen shrubs of *Prunus Laurocerasus*, *Rhododendron ponticum*. and some ferns. In the valleys open to the south *Corylus Avellana*, was beginning to blossom, in the valley-bottoms devoid of forest vegetation *Tussilago Farfara*, *Petasites officinalis*, *Cyclamen coum*, *Helleborus Kochii*, and *Primula acaulis* were already attracting butterflies and other insects, and in sunny places lazily and feebly moving lizards could be seen. The forests were only partly in their winter rest. Besides the evergreen *Rhododendron*, *Prunus*, *Hypericum calycinum*, and *Hedera colchica*, one could notice *Rubus* sp., *Euphorbia amygdaloides*, *Digitalis ferruginea*, *Festuca montana* and *Calamintha grandiflora* — covered with green leaves[1]).

The road from Ada-Bazar, which is situated at only 120 m altitude, leads to Hendek through the plains, where the lower part of the Sakaria and its chief right-sided tributary the Mudurlu, have their courses. In spring and in autumn, when the waters of these rivers overflow, the road is in some places impassable, and even during the driest summer months some places are rather bad for the drivers on account of the shaky bridges, which are full of holes and appear to be situated over dangerously deep swamps.

After passing the vicinity of Ada-Bazar, very rich in fruit-trees, corn-fields, and plantations of all kinds of vegetables, one enters into comparatively dry plains — uncultivated probably on account of their being inundated during the high level of the waters[2]); they are overgrown with *Goebelia (Sophora) Jauberti*. Solitary trees of *Ulmus campestris*, with their branches strongly cut off (lack of wood!) are seen; the road itself is bordered at the beginning by walnut-trees, chestnuts, and plum-trees. The hedges of *Rubus* spp. are deeply covered with dust. Farther on, when one enters still lower parts, all this vegetation ceases and one sees island-like dry pieces of land overgrown with *Salix*, *Quercus*, *Carpinus* etc. entwined with huge creepers *(Tamus, Smilax, Clematis, Humulus Lupulus)*, surrounded by wide areas of water communities

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[1]) The winter aspect of the forests from the Cham-Dagh is seen in the pictures (1, 3, 7 etc.) and in the winter-records, which are given together with those obtained during the summer stay, for the sake of better comparison (Table I—IV).

[2]) This description concerns our summer-journey.

(*Typha, Phragmites, Iris, Sparganium, Scirpus, Carex),* among which — in free places — innumerable black turtles (said to be poisonous!) are floating or sitting in companies on rotting logs of wood[1]). In less wet places — *Euphorbia palustris* together with *Carex* sp. and *Thalictrum angustifolium* var. *heterophyllum* form communities, among which white herons and storks are seen slowly walking about.

Soon after the last dangerous bridge is passed, the landscape changes its aspect on account of the rising level of the ground. On the slopes of hills appears shiblyak of a very poor quality, consisting of shrub-oaks and *Paliurus aculeatus.* The composition of the brushwoods becomes richer as one ascends, and near Hendek one can already see evergreen *Erica arborea* and *Arbutus Unedo.*

**Hendek and Cham-Dagh.** The only existing description of the Cham-Dagh, on the southern slopes of which Hendek is situated, is given by the geologist Berg (8). However, he did not climb the highest summit, nor did he ever visit the southern part of the massif. Consequently this part of his map remains a blank. Owing to this circumstance I preferred to make use of the field map prepared by my late husband of the southern part of the massif, and to give it in the text, which will enable the reader to follow the descriptions given below (see map. 2).

As is seen from Berg's map, the only part that was visited by him and by us, is the valley of Ulu-Dere, which he, however, mentions as Deirmen Deressi[2]). According to Berg — the slopes of this valley are built of phyllitic slates, which change on the river-divide ridges into "quartzitischer massiger Arkosen". This rock constitutes the whole river-divide ridges, which "im ganzen Gebirge eine auffallende Gipfelgleiche

[1]) These clusters of trees gave us a striking impression because of ther inaccessibility and still more of their richness in woody creepers. When I think of them now, after reading the description of the Longos-forest in Bulgaria by Stoyanoff (79) and after a recent personal visit to the forest of the lower course of the river Kamčija (1936), I ask myself whether we are not dealing with fragments of communities similar to those of Longos, and whether these groups do not represent the remnants of much vaster forests, which probably once covered the lowlands of Ak-Ova, and owe their survival till nowadays only to their being surrounded by deep swamps. Endriss, who passed the same way from Ada-Bazar to Hendek in 1910, mentions "der üppige, einem Urwald ähnliche Baumbestand" (20, p. 62; in the same booklet, p. 65, we find some slight impressions of the vegetation of the Cham-Dagh).

[2]) It often happens in Turkey, that localities are named quite differently by different persons of the same village or town.

zeigen, so daß man wohl annehmen kann, daß die jetzige Höhe des Gebirges einer alten Abrasions- oder Rumpffläche entspricht". When descending the northern slopes he encountered clay-slates, sandstones and black limestones, whose strata contained fossils, allowing one to determine the age of them as Devonian[1]). Lower down he entered the zone of Upper Cretaceous limestones bearing characteristic features of a karst landscape (the presence of dolines) and being in the east probably folded. The change in the geological structure was displayed at once in the character of the vegatation: on the Cretaceous substratum no more dense beech-, oak- or pine-forests were seen (Berg, l. c. p. 468, 469).

The explorations of Cham-Dagh by the late Prof. Czeczott and Prof. Nikitin, led to the conclusion that the southern part of the massif consisted exclusively of the sedimentary deposits, namely of fine grained mica sandstones, sericitic and arcosic sandstones, and clay-slates. All of them are not strictly localized, and transitions from one to another are observed even in the same stratum. Consequently I have not noticed any connection between the character of the vegetation and the petrographic constitution of the massif. The vegetation seems to be chiefly dependent on the exposure of the slopes. As in Cham-Dagh I had no possibility of making meteorological observations, I could judge of the local climatic conditions only from the presence of some plants, the ecological features of which are more or less known.

Wandering in the valleys and on the crests of this picturesque mountain-massif, I came to the conclusion that it really represents a peneplain, which has been modified by the energetic action of the waters; they created in the apparently monotonous landscape of a peneplain deeply cut valleys and ravines, narrow to such an extent and with such steep slopes, that they cannot be used, save Ulu-Dere, for roads (see Pl. I, Phot. 1 and Section along the valley of Ulu-Dere, facing p. 42). The very energetic erosion displays itself not only in the extreme steepness of the slopes, but also in the presence of areas where soil is sliding down, where the vegetation — when present — is under constant danger of destruction. The rejuvenation of the river-valleys is displayed also by the existence of numerous small cascades and even (in the winter-time) rather imposing waterfalls in some ravines (Pl. I, Phot. 2), which — together with the

[1]) It is interesting to note, that the author of the "Rapport sur le Bassin cuivreux de Hendek" — Bernard (1910) mentions from the district of Cham-Dagh sandstones which contain ammonites of Permian age. (Cited from the unpublished report of Prof. Nikitin.)

presence of luxuriant forest vegetation — add much to the charm of these not very accessible valleys.

The only more or less broad valley is Ulu-Dere (Pl. II). Having the trend from north to south it divides the southern part of Cham-Dagh, so called after its highest summit overgrown with the pine-trees (cham — in Turkish — pine), into western and eastern parts; the former bears the name of Kurt-Dagh, the latter — of Yldiz-Dagh. I have visited but once (during the winter stay) the last mountains, but the chief part of our twofold sojourn we spent in Kurt-Dagh in exploring its central part and southern slopes. — To return to the chief valley of the southern portion of Cham-Dagh, I suppose that its name "beautiful" comes from its exposure to the south, thanks to which it is covered very early in the spring with numerous flowers, whilst the side valleys or those situated in the central part are devoid of them, being covered with a thin snow layer or excessively shaded by forests. — In the valley of Ulu-Dere, in its central part, is visible a terrace, raised above the present level of the water some scores of metres. In the lower part of the valley-bed and on this terrace there is a road, which serves for the herd of cattle and for transporting the wood from the interior part of the mountains. Other roads are situated on the rounded crests of the mountains, which fact characterizes in itself the already mentioned steepness of the valleys and flatness of the highest points. All roads are in a very primitive state.

The vegetation of Cham-Dagh is really very beautiful, but only in the inaccessible valleys; the remnants of the former forests, on the crests, are very much injured by the ax. The forest vegetation of the highest summit — Cham-Dagh (which proved to be only a little surpassing 900 m) was much destroyed by fire.

The Cham-Dagh has not attracted till now any botanist, in consequence its vegetation remained unknown, therefore I shall try to describe it in all details.

The vegetation of Cham-Dagh can be divided into two vertical zones. I — the zone of cultivated land and brushwood communities reaches from 200 to 350 (400) m, and II — the zone of deciduous forests — from 350 to 850 m. The third zone — of coniferous forests — is undeveloped, although in the highest part of the mountains, on the northern slope, we are already dealing with the lowermost part of this zone, two species of pine-trees being present.

The distribution of plant communities in the first zone is strongly influenced by the activities of man: all more level spaces, with deeper

soils, are occupied by tobacco or vegetable cultures, all the steeper slopes and stony crests are covered with brushwoods. As the product of the deterioration of the rocks which build this massif, very clayey soils are characteristics of the lower region of the mountains. Probably these grounds are very favourable to the cultivation of tobacco, because cornfields are seldom seen, but maize is more common. Among fruit trees walnuts are very often found.

Of brushwoods, covering all unfavourable places, three different kinds can be distinguished: 1. mesophytic shrubberies consisting of *Rhododendron ponticum*, *Prunus Laurocerasus*, *Corylus Avellana* etc., occupying the slopes of the ravines with northern and western exposures (see p. 8, record No. 5). They doubtlessly represent secondary communities caused by the removal by lumbering of all high trees (beech and hornbeam). Their upper limit depends on the degree of destruction of forests and sometimes extends very far upwards[1]). 2. Pure oak brush-woods, 3—6 m in height (Pl. III, Phot. 5). They were met with at an altitude from 200 to 370 m[2]). These communities consist of shrub- or small-tree oaks, having deciduous leaves, which proved to represent *Q. infectoria* × *polycarpa*[3]). Above the thickets of these stand single high trees of *Quercus conferta*. It is hard to tell whether they are the remnants of former closed forests consisting of this species, and having as undergrowth the above-named shrub-oaks, or whether they represent a natural community, corresponding to the climatic conditions of this altitude. The absence of stumps would seem to favour the latter supposition. 3. Communities built half and half of deciduous and evergreen species (Table I). The former are again represented by the above-mentioned oaks, the latter — by *Arbutus Unedo*, *Erica arborea*, *Hypericum calycinum*, *Ruscus*. I refer these communities to macchie, which are, however, very depauperated in their floristical composition[4]). Their poorness in number of species is compensated by the stately, very fresh appearence and abundance of *Arbutus Unedo* (compare observation

[1]) On the flat crest of Salman-Tepe they are to be found from 296 to 544 m.

[2]) At 428 m (on Salman-Tepe) shrubs of oaks — although very low and scattered — still persist.

[3]) Very few specimens collected in this community represent this hybrid, but perhaps *Q. infectoria* and *Q. polycarpa* themselves are also present.

[4]) The definitions of the different types of brushwoods, which are comparable with those met with in Northern Asia Minor, are to be found in: Turrill, 85, p. 144—155.

No. 38), richly flowering and fruiting[1]). Whether macchie are here climax communities or represent the undergrowth of the destroyed forests — it is difficult to tell. It has been pointed out above that at a lower altitude stumps are lacking. The increase in abundance of *Hypericum calycinum* in the upper part of this region, which species is the constant companion of the oak forests of the second zone, would speak for the second supposition as related to macchie, which occupy the higher altitudinal positions. Macchie on the southern slopes of the Cham-Dagh were studied by me very superficially and all data obtained in the three observations are given in Table I. Still less time could be devoted to the oak-brushwoods. Anyhow they do not extend above 400 m altitude.

In the lower part of the first region we very often find on the outskirts of oak-thickets small spaces covered with two species of *Cistus* (*C. villosus* and *C. salviifolius*) accompanied by *Teucrium Chamaedrys*, *Erythraea Centaurium* etc. In the month of June this community is really charming thanks to the innumerable white and pink flowers of the *Cistus* species and the darker pink ones of *Erythraea*. It is not only very beautiful, but also the most animated community on account of the swarms of insects looking for honey. Putting aside the question of the independence of this community (both *Cistus* species enter also the margin of the macchie), I refer it to phrygana.

The lower part of the valley Ulu-Dere, which belongs to our first region, is characterised by the presence of huge trees of *Platanus orientalis* (Pl. III. Phot. 6), more rarely of *Carpinus Betulus*. Occasional solitary shrubs of *Rosa* serve as support for *Smilax excelsa*; small groups of *Prunus spinosa* (?) are safe places for innumerable spring flowers (*Galanthus nivalis* and *Cyclamen coum*); *Helleborus Kochii* and *Digitalis ferruginea*[2]) occupy more raised places, whilst *Tussilago Farfara* and *Primula acaulis* grow in the proximity of water. Most of the bottom is bare, probably on account of the floods in the spring time.

In the hedges which accompany the roads or surround the different plantations, I have noticed the following species:

| | |
|---|---|
| *Rosa* sp. | *Clematis Vitalba* |
| *Rubus* spp. | *Smilax excelsa* |
| *Rubus discolor* | *Tamus communis* |

*(continuation on p. 10)*

[1]) Endriss (19, p. 402) mentions for the vicinity of Hendek *Quercus Ilex* and *Buxus sempervirens*, which species I have not met with.

[2]) Even in February these two species retained their green rosettes of leaves.

***Rhododendron ponticum* brushwood.** No. 5. 3. II. 1925. Slope to the valley Ulu-Dere. Altitude 320 m. Exposure: W.

Low trees and shrubs:

5.4 *Rhododendron ponticum* — $1^1/_2$—2 m high.
2.3 *Fagus orientalis* — 3—5 m high, many stemmed.
2.3 *Ulmus* sp. — short stems covered with numerous shoots.
r. 1 *Quercus* sp. — one shrub 2 m high.
*Prunus Laurocerasus* — 2—3 m in height.
r. 1 *Rubus* sp.

Ferns:

1.1 *Aspidium aculeatum* var. *vulgare*
*Asplenium Adiantum nigrum*

Creepers:

2.3 *Hedera colchica?*

### Explanation of signs used in the phytosociological records. in the text and tables.

The first figure of each column (or the two first figures divided by a dash) denotes the degree of cover and abundance or frequency (combined) of each species, expressed in a 5-degree scale. In general it corresponds to the scale given by Braun-Blanquet (Pflanzensoziologie, p. 31, 1928) with the exception of the two first degrees, which according to this author are: 1 — „reichlich, aber mit geringem Deckungswert", 2 — „sehr zahlreich oder mindestens $^1/_{20}$ der Aufnahmefläche deckend". I designated with 1 — sparsely distributed species, with 2 — frequent (not „very frequent"). To denote very seldom met with species I used the initial letter of "rare" — r. With a cross (+) I marked the species, for which the frequency degree had been not designated on the spot, during the fieldwork (in the text records they are not preceded by any mark).

In the second place in each column, divided by a full stop from the former, there is the figure denoting sociability, i. e. the way in which every species has been seen occurring[1]). It is expressed also in a 5-degree scale, whose degrees denote: 1 — growing isolated, 2 — in little groups (or tufts), 3 — in troops (or small patches), 4 — in crowds (forming larger patches), 5 — in big herds (Braun-Blanquet, l. c. p. 32).

In the observations made in the winter time or early spring I marked also for some species the phenological aspect: **lv.** meaning with green leaves, **dr. lv.** — retaining the dry leaves on branches, **fr.** — bearing fruits, **fl.** — being in blossom, **bd.** — having flower buds. The phenological aspect is marked also in some observations of steppe communities.

[1]) I quite agree with Sukatschew ("A small textbook for the study of forest-types" p. 60, 1927, in Russian), that the much used term "sociability" for this phenomenon is not suitable, for there are species, as for example *Tussilago Farfara*, which grow in troops or crowds, thus possessing a rather high degree of "sociability", but in fact being very unsociable, as they vanish as soon as other species appear, but I use the term for the lack of a better one.

TABLE I

## BRUSHWOOD-COMMUNITIES IN THE CHAM-DAGH (BITHYNIA).

| Locality | Choban-Yatak | Ibrik-Dere | Salman-Tepe |
|---|---|---|---|
| No. of observation and date | No. 11<br>8. II. 25 | No. 1<br>1. II. 25 | No. 38<br>6. II. 25 |
| **Ecological characteristics** | | | |
| Altitude, metres above sea-level . | 191 | 300—400 | 255—371 |
| Exposure . . . . . . . . . . . . . | SW | S—SW | S—SE and S |
| Exposure to the winds . . . . . . | — | unsheltered | unsheltered |
| Subsoil and soil . . . . . . . . . | — | Chloritic, sericitic slates and sandstones, soil clayey | Sandstones? (outcrop at 371 m) |
| **Phytosociological characteristics** | | | |
| **Stratification and floristic composition** | | | |
| Stratum of small trees (3—4 m) and tall shrubs (1—1½ m): | | | |
| dr. lv. *Quercus polycarpa?* . . . / *Q. infectoria* × *polycarpa* . | 2.3 | + | + |
| dr. lv. *Q. conferta*[1]) . . . . . . . . | ? | 1.1 | 1.1 |
| lv. *Erica arborea* . . . . . . . | 4—5.3 | + | 1—3.2—4 |
| lv. fl. *Arbutus Unedo* . . . . . . | 2.2 | + | 4.4—5 |
| lv. *Genista Lydia* . . . . . . . . | — | — | 1.2 |
| Small-shrub and ground stratum: | | | |
| lv. *Cistus salviifolius* . . . . / *C. villosus* var. *tauricus* . . | 4.2—3 | — | + |
| lv. *Hypericum calycinum* . . . | 3.2 | 3—4.4 | 2.3 |
| lv. *Dorycnium latifolium* . . . . | 1.1 | — | + |
| *Ruscus aculeatus* . . . . . | — | — | + |
| lv. *R. hypoglossum* . . . . . . | — | — | 1.2 |
| dr. lv. *Pteridium aquilinum* . . . . | — | 3.2 | + |
| *Rubus* spp. . . . . . . . . . | — | — | r. 1 |
| lv. *Gramineae* . . . . . . . . . | 3.1 | — | — |
| dr. lv. and fr. *Carlina longifolia* var. *bithynica* . . . . . . . | — | + | — |
| Bottom stratum: | Almost closed cover of mosses, lichens and fungi | no record | no record |
| *Cladonia furcata* var. *racemosa* . | + | | |
| *Cl. rangiformis* var. *pungens* . . . | + | | |
| *Cl. fimbriata* f. *simplex* . . . . . | + | | |

[1]) In both localities — large solitary trees.

| | |
|---|---|
| *Pyracantha coccinea* | *Pteris aquilina* |
| *Ligustrum vulgare* | *Ruscus aculeatus* |
| *Laurus nobilis* | *Arum Nickelii* |
| *Humulus Lupulus* | *Polygonatum* sp. |
| *Calystegia silvestris* | *Umbelliferae* spp. |

On the crests and in the valleys, beginning at an altitude of about 400 m. the forests make their appearance[1]).

When the valley is narrow and its slopes are steep — independently of the exposure the beech-forest is dominant (often with admixture of the hornbeam, silver lime and chestnut); in the more open valleys, the dependence of the forest type on the exposure is distinctly seen. Thus the slopes with S and E exposures and all slopes with intermediate ones (S—SE, SE, E—SE) are covered with oak-forests (with admixture again of silver lime and hornbeam), all those with N and W exposures — with beech forests. It seems that the composition of the oak-forest does not change with altitude. As seen from the list below (Table II) it consists of numerous species. Since I have had the opportunity of studying this community 9 times, three in the winter-time and six — in summer, in one locality I have been able to compare its winter and summer aspects on the same spot.

In the oak-forests of Cham-Dagh (Pl. II, Phot. 3, 4) three distinct layers can be recognized:

I — the stratum of trees, which consists chiefly of oaks. The oak-tree is represented here not only by *Quercus polycarpa* Schur but also by a near species — *Q. iberica* M. B.[2]). As to *Q. conferta* Kit. (*Q. Frainetto*) it seems to be limited to the oak-brushwoods of zone I.

The oaks are of medium height (10—12 metres) and stand 5—15 metres from each other. Their circumference (at the height of 1,5 m) is mostly 20—40 cm, but for the oldest trees 1,25—2,25 metres. The comparatively short growth may be caused by the shallow soils and the stony subsoil.

The oak woods of Cham-Dagh are a light and gay plant-community. The trees often give place to smaller or greater free spaces, where *Hypericum calycinum*, with its large yellow flowers reigns almost supreme.

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[1]) In deep ravines, sheltered from all sides, forest begins already at an altitude of 260 m.

[2]) See notes on *Quercus* in the List of collected plants, Part. II.

Sometimes it is accompanied by *Vicia cassubica* or *Pyrethrum Parthenium*. All together they form a rather vivid and picturesque carpet.

II — the layer of evergreen shrubs, *Erica arborea* and *Arbutus Unedo* (Pl.V, Phot. 10) accompanied by tall shrubs of *Genista patula*, which even in February retains some of its leaves, and a lower shrub — *Genista Lydia*. *Mespilus germanica*, *Salix caprea* and *Vaccinium Arctostaphylos* are found more seldom.

III — 40—50 cm in height, consists of *Hypericum calycinum* (also evergreen), *Dorycnium latifolium*, *Astragalus glycyphyllus*, *Cytisus supinus* var. *argyrotrichus*, *Lathyrus undulatus* — with splendid large pink flowers, *Orobus hirsutus* var. *glabratus*, our *Coronilla varia*. *Rubus tereticaulis* var. *saxetanus* f. *anatolicus*, *Cirsium hypoleucum* — with pretty raspberry coloured flowers, more seldom — *Trachystemon orientale* and *Euphorbia amygdaloides*. Among the great number of *Leguminosae* grasses grow here and there: *Festuca montana*, *Brachypodium pinnatum*, *Dactylis glomerata*. The fern *Asplenium Adiantum nigrum* and strowberry seem to be bound with the presence of rocks.

The comparison of all observations made by me of oak-forests (Table II) leads one to the following conclusions:

The oak woods in northwestern Anatolia even in winter time have no period of total rest: the presence of evergreen undergrowth of *Arbutus* and *Erica* and, in the ground-stratum, of *Hypericum calycinum* shows the great difference between these forests and our European oak woods (of *Quercus sessiliflora*).

I presume, that in the mountains of Cham-Dagh we have to do with only one association of *Quercus polycarpa*, probably, however, several facies could be distinguished. This association, which I shall name *Quercetum polycarpae bithynicum*, has for determinant[1]) species *Arbutus Unedo*, *Erica arborea* and *Hypericum calycinum*.

Having in view a very scanty number of observations I shall draw no further conclusions.

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[1]) Sukatschew (80, p. 303) introduces this term for the species, which possess high sociological value, that is — to quoth the author — "Wir sind gezwungen, als Determinanten einer Assoziation solche Arten anzuerkennen, welche die Schichtung, die phänologische Gesellschaftsaspekte, das Vorhandensein in der Gesellschaft einzelner Synusien bestimmen, und die eine bedeutende Rolle bei der Zusammensetzung jeder einzelnen Schicht oder jedes phänologischen Aspektes spielen". He ranks as "determinants" all species, which possess at least the degree of abundance and frequency 3 (according to the scale of Braun-Blanquet) or are marked with cop[1] (if the scale by Drude be used).

TABLE II

## OAK WOODS (QUERCETUM POLYCARPAE)

| Locality | Isak-Oglu-Dere | Isak-Oglu-Dere | Yilman I |
|---|---|---|---|
| No. of observation and date | No. 27<br>27. VI. 25 | No. 13<br>11. II. 25 | No. 19<br>25. VI. 25 |
| **Ecological characteristics** | | | |
| Altitude, metres above sea-level | 365 | 451 | 417—425 |
| Exposure | S—SE and S | S | SE |
| Exposure to the winds | — | unsheltered | — |
| Angle of incline | ca. 35° | steep | ca. 35° |
| Subsoil and soil | sandstone, sandy clay | — | sericitic slates, soil shallow, 10 to 20 cm, with protruding rock |
| **Phytosociological characteristics** | | | |
| Vitality (presence of seedlings) | Seedlings and saplings numerous | no record | Saplings in all ages in great abundance |
| **Stratification and floristic composition** | | | |
| Tree stratum: | Distance between trees 12—15 m. Oaks 20 to 50—125 cm in circumfer. | Oaks 5—10 m distant from each other, very irregular in shape and often with broken tops | Oaks 20 to 40 cm in circumfer. *Tilia* about 20 cm in circumfer. |
| *Quercus polycarpa*[1]) | 4.3—4 | 3.4 | 3—4.3 |
| *Tilia tomentosa* | r. 1 | — | 2—3.3—4[4]) |
| *Fagus orientalis* | — | — | 1.1 |
| *Carpinus Betulus* | — | — | 1.1 |
| *Castanea vesca* | — | — | r.1 |
| *Populus tremula* | — | — | — |
| *Sorbus torminalis* | — | — | — |

TABLE II

## IN THE CHAM-DAGH (BITHYNIA).

| Yilman I | Okhlamurluk | Okhlamurluk | Okhlamurluk | Okhlamurluk | Hussein-Sheikh-Dere |
|---|---|---|---|---|---|
| No. 20<br>25. VI. 25 | No. 16<br>24. VI. 25 | No. 6[7])<br>3. II. 25 | No. 17<br>24. VI. 25 | No. 18<br>24. VI. 25 | No. 10<br>4. II. 25 |
| 549 | 431—523 | 526 | 530 | 594 | 461 |
| E—SE | S and S—SE | S and S—SE | S | S | S |
| unsheltered | unsheltered | unsheltered | unsheltered | unsheltered | ? |
| very steep | 30—35° | ca. 30° | ca. 30° | ca. 30° | ? |
| sandstone | seriticic slates, soil shallow and stony | sandstone, soil shallow and stony | slates and sandstones; shallow soil with great admixture of stones | slates and sandstones; brown clayey soil 5 to 10 cm deep, with great admixture of stones | — |
| Seedlings and saplings: oak 3—4, beech and lime-tree r—1, poplar very abundant | no record | no record | no record | no record | no record |
| Oaks 70 to 145 cm in circumfer. beech 25 cm | Very thin, covering about $^1/_{10}$ of surface | Young forest, oaks 10 m high, older trees often with broken tops | Oaks 10-12 m high, having about 90 cm in circumfer. | Oaks 15 to 65 cm in circumfer. (thinner prevail) cover about $^1/_{10}$ of surface | |
| 3—4.3 | 2—3.1 | + | + | 2—3.2 | 3.? |
| 1.2 | r—1.1[4]) | — | — | — | — |
| r.1 | 1.1 | + | — | r—1.1 | 1.? |
| — | 1—2.1 | + | — | r. 1 | — |
| — | — | — | r. 1 | — | — |
| r.1 | r. 1 | — | — | — | — |
| — | + | — | — | — | — |

TABLE II *(continued)*

| No. of observation and date | No. 27 27. VI. 25 | No. 13 11. II. 25 | No. 19 25. VI. 25 |
|---|---|---|---|
| Tall-shrub stratum: | about 3 m high | 1 ½—2 m high | |
| *Arbutus Unedo* | 3—4.2 | 3.4[3]) | r. 1 |
| *Erica arborea* | 3.2 | 2.3 | 1—2.2 |
| *Genista Lydia* | 2.? | — | 2—3.2 |
| *Genista patula?* | — | — | — |
| *Mespilus germanica* | r. 1 | — | — |
| *Vaccinium Arctostaphylos* | — | — | r. 1 |
| *Corylus Avellana* | — | — | — |
| *Crataegus monogyna?* | — | — | — |
| *Salix caprea* f. *orbiculata* | — | — | r. 1 |
| *Rhododendron ponticum* | — | — | — |
| Small-shrub-stratum: | | 25 cm high | |
| *Hypericum calycinum* | 1—3.2[2]) | 2.3 | 2—3.2 |
| *Dorycnium latifolium* | 1.1 | — | 1.1 |
| *Cytisus supinus* var. *argyrotrichus* | — | — | r. 1 |
| *Rubus* spp. | 2.2 | 2.3 | — |
| Ground stratum: | | | |
| *Festuca montana* | 1—2.1—2[2]) | 2.1—2 | 2.2 |
| *Ruscus hypoglossum* | 1.2 | r. 1 | r. 1 |
| *Galium* sp. | 1.1 | r. 1 | 1.1 |
| *Lathyrus undulatus* | — | — | 1.2 |
| *Coronilla varia* | — | — | 1.1 |
| *Vicia cassubica* | — | — | 1.2—3 |
| *Campanula persicifolia* | — | — | 1.2 |
| *Trachystemon orientale* | — | — | 1.2 |
| *Brachypodium silvaticum* | — | — | — |
| *Brachypodium pinnatum* | — | + | — |
| *Astragalus glycyphyllos* var. *bosniacus* | r. 1 | — | — |
| *Lathyrus inermis* var. *glabriusculus* | — | — | — |
| *Ononis* sp. | — | — | — |
| *Silene dichotoma* | — | — | — |
| *Cirsium hypoleucum* | — | — | r. 1 |
| *Cephalanthera rubra* | — | — | — |
| *Euphorbia amygdaloides* | — | — | r. 1 |
| *Calamintha grandiflora* | — | — | 1.1—2 |
| *Viola* sp. | — | r. 1 | — |
| *Briza* sp. | — | — | — |
| *Dactylis glomerata* | — | — | + |
| *Fragaria vesca* | — | — | — |
| *Myosotis* sp. | — | — | — |
| *Luzula Forsteri?* | — | — | — |

TABLE II

| No. 20<br>25. VI. 25 | No. 16<br>24. VI. 25 | No. 6<br>3. II. 25 | No. 17<br>24. VI. 25 | No. 18<br>24. VI. 25 | No. 10<br>4. II. 25 |
|---|---|---|---|---|---|
| | 1—3 m high | | 1½—2 m high | | |
| r. 1.1 | 2—4.3 | 2—3.? | 3—4.2—3 | 2—3.2 | 3.? |
| 2.2 | 2.1—2 | 2—3.? | 3.2 | 3.3 | 4.5 |
| — | ?r—1.2 | — | — | — | 2.?[8]) |
| — | — | — | — | 3.2—3 | — |
| — | — | — | — | — | — |
| — | — | — | — | 1.1 | — |
| r. 1 | — | — | — | — | — |
| — | r. 1 | — | — | 1.1 | — |
| — | — | — | — | — | — |
| — | — | — | — | — | r. 1[9]) |
| | | | | | |
| 2.2 | 3—4.4 | 4.5 | 2.2—3 | 2.1 | 1.? |
| 2.2 | 1.1 | — | 1.1 | — | — |
| r. 1 | r. 1 | — | — | — | — |
| 2.2[6]) | — | — | — | 3.2 | — |
| | | | | | |
| 1.1 | 1—2.1 | — | — | 2—3.2 | — |
| — | — | — | — | — | — |
| — | — | — | — | 1—2.1 | — |
| 2.1 | — | — | 1.1 | — | — |
| 2.2 | — | — | 1.1 | 1.1 | — |
| 1.1 | — | — | 1.1 | — | — |
| 1—2.1 | r. 1—2 | — | ?1.1 | — | — |
| — | — | — | — | — | — |
| — | — | — | — | 1.1 | — |
| — | — | — | — | — | — |
| — | — | — | — | — | — |
| — | — | — | — | 1.1 | — |
| — | 1—2.1 | — | — | — | — |
| — | 2.2 | — | — | — | — |
| — | — | — | — | 1.1 | — |
| r. 1 | — | — | — | r. 1 | — |
| — | — | — | — | — | — |
| — | — | — | — | — | — |
| — | — | — | — | — | — |
| 2.1 | — | — | — | — | — |
| — | — | — | — | — | — |
| — | — | r. 1 | — | — | — |
| — | — | r. 1 | — | — | — |
| — | — | ? r. 1 | — | — | — |

TABLE II *(continued)*

| No. of observation and date | No. 27 27. VI. 25 | No. 13 11. II. 25 | No. 19 25. VI. 25 |
|---|---|---|---|
| Ground stratum: *(cont.)* | | | |
| *Pyrethrum Parthenium* | — | — | — |
| *Pteridium aquilinum* | — | — | — |
| *Asplenium Adiantum nigrum* | — | — | — |
| Mosses, lichens and fungi: | no record | Mosses and lichens-mostly on the bark of trees and shrubs[4]) | no record |
| *Thamnium alopecurum* | | + | |
| *Anomodon viticulosus* | | + | |
| *Homalothecium sericeum* | | + | |
| *Lobaria linita* | | + | |
| *Peltigera horizontalis* | | — | +[5]) |
| *Usnea anatolica* | | + | |
| *Daedalea quercina* | | + | |

[1]) During the fieldwork it was supposed that only one species of oak took part in the composition of the forests in Cham-Dagh. While arranging systematically the collections it has come out that two species of oak related to *Quercus sessiliflora* Salisb. are present there: *Q. polycarpa* Schur. and *Q. iberica* M. B. Although the latter seems to occur very seldom, it must be understood that the designation of abundance and the way of occurrence applies perhaps to the two species taken together.

[2]) The second numbers apply to the occurrences on the southern slope.

[3]) The shrubs of *Arbutus Unedo* were here 2 m in height, with the stems about 30 cm in circumference. A very beautiful *Usnea* covering abundantly its

Passing to the beech-forests of Cham-Dagh, we must state, that they are represented here by at least two associations. One of them occupies the steep sheltered slopes of the narrow valleys, and possesses rich undergrowth consisting of *Rhododendron ponticum*, the second is to be found on less steep slopes, mostly with northern exposure and situated on flat rounded crests, unsheltered against the influence of winds. We saw it at different heights: from 360 to 865 m. *Rhododendron* is either totally lacking in the latter or is present in quite insignificant quantity (in depressions), but instead it has rather rich ground vegetation consisting of herbs and forbs, while the first type of beech forest is nearly devoid of them.

Let us begin with the second. At an altitude of 360—865 metres it represents pure beech forest with rich undergrowth of beech in all stages

TABLE II

| No. 20<br>25. VI. 25 | No. 16<br>24. VI. 25 | No. 6<br>3. II. 25 | No. 17<br>24. VI. 25 | No. 18<br>24. VI. 25 | No. 10<br>4. II. 25 |
|---|---|---|---|---|---|
| — | — | — | 1.2 | — | — |
| 1.2 | 1.2 | — | — | — | — |
| — | — | r. 1 | — | — | — |
| no record | no record | no record | no record | no record | no record |

branches attracted my attention and was collected. It proved afterwards to be a new species.

⁴) The lime-tree, just in blossom, grows by several stems from one root.

⁵) On the bark of *Arbutus Unedo.*

⁶) Probably *Rubus tereticaulis* P. J. Müll.

⁷) This is the winter aspect of the community described under No. 17.

⁸) It is evident that *Rhododendron* is quite out of place in this community: it was met with very seldom and attained the height of ¼ m only.

⁹) With few remaining green leaves.

of age. Although the beech is represented here by another species than in Central Europe (*Fagus orientalis* Lipsky) the forest itself has much the same appearance (Pl. IV, Phot. 7, 8). The trees are 3—8 metres distant from each other, their circumferences in the best specimens slightly exceed 2 m (at the height of 1.5 m). Except for the young generation of beeches, we rarely see *Corylus Avellana, Mespilus germanica,* and *Ilex aquifolium* in the undergrowth; *Vaccinium Arctostaphylos* is still rarer and seems to be more closely bound to those parts of the beech forest, where there is a more or less stronger admixture of the hornbeam[1]).

[1]) On the flat crests this mixed beech-hornbeam forest merges in places into nearly pure hornbeam forest with a very rich undergrowth of *Vaccinium Arctostaphylos, Corylus Avellana* and thickets of young hornbeams. During my too short explorations I have not succeeded in completely investigating the con-

As has been pointed out above, the beech forest of this type has rather rich ground vegetation. Even in the winter time it is partly green, because the layer of snow is very thin and in places it does not last at all[1]). It consists of *Rubus* spp., *Festuca montana, Brachypodium silvaticum, Luzula Forsteri* (for full list of species see Table III). We shall name this association — on account of this ground vegetation — *Fagetum herbosum* (records 28, 3, 14, 9,32? of Table III).

At the moment we start descending into narrow valleys *Rhododendron* immediately appears, at first in the form of quite flattened shrubs, but 20 cm in height, and very distant from each other, but as we gradually descend, they become taller and taller till they surpass human height (Pl. V, Phot. 9), and at the same time they approach each other forming inpenetrable thickets, through which it is impossible to advance without the aid of a hachet. This is true for Isak-Oglu-Dere, Ibrik-Dere, the side-valleys of Ulu-Dere, the so-called Su-Atak-Dere, with its beautiful waterfall, and the other one (having at its outlet to Ulu-Dere, on the right side the mount of Yilman, and on the left Okhlamurluk-Tepe — lime-tree mountain, called so on account of the great number of *Tilia tomentosa*), or the valleys in the western part of the whole system, for example Hussein-Scheikh-Dere. In the upper part, where the rhododendrons still grow apart, they are accompanied by *Mespilus germanica, Corylus Avellana, Sambucus, Vaccinium Arctostaphylos* and *Ilex aquifolium*, while in the free spaces between them may be found *Ruscus hypoglossum*, *Trachystemon orientale* (in June — already devoid of flowers), more seldom — *Euphorbia amygdaloides, Cirsium hypoleucum* and *Hypericum calycinum* (the latter looks like a fugitive from the oak-woods, for which it is very characteristic). Here and there, near the stones and rocks, one may find also the pretty fern *Scolopendrium officinale* (very characteristic of the immediate proximity of brooks!). The beech-trees are

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ditions of soil and climate which cause in some places on the flat crests pure forests of hornbeam (rare), pure forests of beech, or mixed forest of the two, but I suppose, that what Vinogradov-Nikitin says about beech-hornbeam forests in Caucasian countries, may be also applied here. According to this author, when hornbeam is intermixed with the beech, in case of the cutting out of this forest, the new forest — thanks to the greater capacity for sprouting of *Carpinus Betulus* than of *Fagus orientalis* — may change into a pure hornbeam forest (88, p. 65). — In the Cham-Dagh the forest richest in hornbeam occurs just on flat crests — that is to say in places the most accessible, and therefore no longer conserving their virgin forests, but cut out forests.

[1]) It must be remembered, however, that the winter of 1925 was exceptionally mild.

entwined right up to their tops by sometimes very old specimens of *Hedera colchica*. The latter, together with *Rhododendron ponticum*, make the beech-forest look very attractive even in the winter-time, not quite dead as our Central-European beech-forests look (Pl. V, Phot. 9).

This type of beech forest, after its most characteristic and constant component — *Rhododendron ponticum* — we shall name *Fagetum rhododendrosum* (typically represented by nos. 25, 30, 33, 34 of Table III; nos. 29, 2, 7 and 31 are less typical, representing the transition either to *Fagetum herbosum* or to the stream-woodlands, which will be described below).

At the height of 20—50 metres above the bottom of the valleys *Prunus Laurocerasus* is to be seen accompanying in increasing quantities the *Rhododendron* thickets. This attractive shrub, with very shiny leaves, near the brooks seems to displace wholly the *Rhododendron*, and at the same time we have to deal here with another composition in the tree-layer. We have descended thus to the community which represents the third association in which *Fagus* takes part. In the upper course of the streams, which correspond to the youngest part of valleys, having still the shape of a V, this mixed forest with the densest undergrowth of *Prunus Laurocerasus* fills up the whole space (Pl. VIII, Phot. 15). The only place for walking is in the water-stream itself, which here and there bears, among the protruding rocks and boulders, tufts of *Carex remota*, imposing *Carex maxima* and *Scirpus Holoschaenus*. On the narrow strip between the level of the water and the *Prunus Laurocerasus* shrubs there are to be found *Sanicula europaea*, *Asarum europaeum* var. *caucasicum* and *Dentaria bulbifera* (seldom), which, driven out by the shadow of *Rhododendron* from their natural abode in the beech forest, try to live here where the slightest overflow of the stream can destroy them. — Let us return to the trees. There are two layers of them: the higher of *Carpinus Betulus*, *Ulmus scabra*, *Castanea sativa*, *Fagus orientalis*, and the lower one — of *Evonymus latifolia* (rare), *Alnus glutinosa*, *Staphylea pinnata*, *Salix alba* and *Salix* spp.; high shrubs of *Sambucus nigra* and *Corylus Avellana* form a transition between the two layers. Many creepers may be noticed as: *Hedera colchica*, *Smilax excelsa*, *Clematis Vitalba*, *Calystegia silvestris* and *Humulus Lupulus*. The sun's rays can hardly penetrate and when they do, they cause a really fabulous play of lights (Pl. VI, Phot. 12, Pl. VIII, Phot. 15). Tired with the vivid southern sunlight the eyes rest with delight in this beautiful wild forest, where even the shadows seem to have greenish colours.

TABLE III

TABLE III

## BEECH-WOODS (FAGETUM ORIENTALIS) IN TH… CHAM-DAGH AND KURMALY-DAGH (BITHYNIA)

| Locality | Isak-Oglu-Dere | Isak-Oglu-Dere | Isak-Oglu-Dere (Phot. 8) | Ibrik-Dere | Ibrik-Dere | Su-Atak-Dere (Phot. 9) | Ada-Basha (Phot. 7) | Ada-Basha | Okhla-murluk | Hussein-Sheikh-Dere | Geuk Tepe: valley of Bichki-Dere (Kurmaly-Dagh) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of observation and date | No. 25 27. VI. 25 | No. 29 27. VI. 25 | No. 28 27. VI. 25 | No. 2 1. II. 25 | No. 3[10]) 1. II. 25 | No. 30 6. II. 25 | No. 14 14. II. 25 | No. 31[13]) 14. II. 25 | No. 7 3. II. 25 | No. 9 4. II. 25 | No. 32[16]) 30. VI. 25 | No. 33 30. VI. 25 | No. 34 30. VI. 25 |
| **Ecological characteristics** | | | | | | | | | | | | | |
| Altitude, metres above sea-level | 257 | 273 | 366 | 420 | 520 | 553 | 865 | 865 | 520 | 398 | 302 | 302 | 310 |
| Exposure | N—NE | E—NE | E | W and E (slopes of a ravine) | E—SE | N | N—NW | N—NE | SW | N and S (slopes of a ravine) | W | E—SE | E |
| Exposure to the winds | sheltered | sheltered | unshel-tered | sheltered | unshel-tered | sheltered | exposed | less exposed | sheltered | sheltered | — | — | sheltered |
| Angle of incline | ca. 35° | — | ca. 15° | ca. 20° | — | 35°—40° | ca. 10° | ca. 40° | ca. 40° | steep | ca. 40° | ca. 35° | steep |
| Subsoil and soil | sandstone, soil shallow (stones protrude) | sandstone? soil shallow | sandstone | coarse sandstone, soil deep clayey | coarse sandsto[ne] | sericitic slates and sandstones | ? | ? | sericitic slates and sandstones | ? | sandstone, soil shallow, stones protrude | granite, soil shallow with outcropping rock | |
| **Phytosociological characteristics** | | | | | | | | | | | | | |
| Vitality (presence of seedlings) | no record | no record | Saplings of beech 3.2; of oak 1—2.1; of lime-tree r. 1 | no record | Saplings of beech very abundant; of oak, 2 m high, also present | Seedlings and saplings very numerous | Seedlings abundant: 3 | no record | no record | no record | Seedlings of beech abundant | no record | no record |
| **Stratification and floristic composition** | | | | | | | | | | | | | |
| Tree stratum: | dense | dense | Beeches 20 m high, the thickest beeches and oaks 2 m in circumfer.[7]) | dense | thin: distances between trees 2 to 15 m | Stately beeches over 2 m in circumfer. | Beeches 3 to 8 m distant, 90—200 cm circumfer. | Trunks of beeches thinner than in locality No. 14 | no record | no record | Old stately beeches, 2 m in circumfer. | Canopy dense, although trees are rather distant from each other | thin |
| *Fagus orientalis* | 4—5.4 | 4—5.4 | 4.4 | 4.4 | + | 4—5.4 | 4.4 | + | + | + | 3.4 | 4.3—4 | 2—3.3 |
| *Quercus polycarpa* | — | — | 2.1 | + | + | — | — | — | + | + | — | — | — |
| *Carpinus Betulus* | 1.1 | 1.2 | — | + | — | — | — | — | — | + | 1.1 | — | — |
| *Castanea vesca* | 1—2.1 | 1.1[5]) | — | + | — | — | — | — | — | — | — | — | r. 1 |
| *Tilia tomentosa* | r. 1 | 1.1 | — | — | — | — | — | — | — | — | — | — | — |
| *Ulmus scabra* | — | — | — | — | — | — | — | — | — | — | — | 1.1 | — |
| *Staphylea pinnata* | — | — | — | — | — | — | — | — | — | — | — | 1.1 | — |
| *Platanus orientalis*[1]) | — | — | — | — | — | — | — | — | — | — | r. 1 | — | — |
| *Cornus australis*? | — | — | — | — | — | — | — | — | — | — | r. 1 | — | — |

TABLE III *(continued)*

| No. of observation and date | No. 25<br>27. VI. 25 | No. 29<br>27. VI. 25 | No. 28<br>27. VI. 25 | No. 2<br>1. II. 25 |
|---|---|---|---|---|
| Tall-shrub stratum: | well developed | | | 3—4 m high |
| *Rhododendron ponticum* | 5.4 | 3.2 | — | 3.4 |
| *Prunus Laurocerasus* | 2—3.2 | — | — | 3.4 |
| *Vaccinium Arctostaphylos* | 1.1 | — | r. 1 | — |
| *Corylus Avellana* | — | — | — | — |
| *Ilex aquifolium* var. *angustifolium* | — | r. 1[6]) | — | — |
| *Erica arborea* | — | — | — | — |
| *Genista Lydia* | — | — | — | — |
| *Arbutus Unedo* | — | — | — | — |
| Small-shrub stratum: | | | | |
| *Rubus* spp.[2]) | 2.2 | 1.2 | 1.1 | — |
| *Hypericum calycinum* | — | 1.1 | 3.2 | — |
| Ground stratum: | | | | covers about ¼ of the surface |
| *Trachystemon orientale* | 3.1 | 2.2 | — | — |
| *Festuca montana* | — | 2.2 | 2—3.1—2 | — |
| *Ruscus hypoglossum* | — | — | — | 2.1 |
| *Luzula Forsteri* | — | 1.2 | 1.1—2 | ? r.1 |
| *Euphorbia amygdaloides* | — | r.1 | 2.1 | — |
| *Digitalis ferruginea* | — | — | — | — |
| *Galium longifolium* | — | — | — | — |
| *Gentiana asclepiadea* | — | — | — | — |
| *Cirsium hypoleucum* | — | — | — | — |
| *Epimedium pubigerum* | — | — | — | — |
| *Brachypodium silvaticum* var. *glabratum* | — | — | 1—2.1 | — |
| *Primula acaulis* | — | — | — | — |
| *Cyclamen coum* | — | — | — | — |
| *Galium* sp.[3]) | — | — | r. 1 | — |
| ? *Anemone* sp. | — | — | — | — |
| *Campanula* sp.[4]) | — | — | — | — |
| *Viola hirta* | — | — | — | — |
| *Carex maxima* | — | — | — | — |
| *Carex Grioletii* | — | — | — | — |
| *Luzula* sp. | — | — | — | — |
| *Scolopendrium officinale* | r. 1 | — | — | 2.1[8]) |
| *Athyrium Filix femina* | — | — | — | — |
| *Aspidium Filix mas* | — | — | — | — |
| *Aspidium aculeatum* var. | — | — | — | + |
| *Aspidium lobatum*? | 1.1 | — | — | — |
| *Asplenium Adiantum nigrum* | — | — | — | + |
| *Asplenium Trichomanes* | — | — | — | +[9]) |

TABLE III

| No. 3 . II. 2 | No. 30 6. II. 25 | No. 14 14. II. 25 | No. 31 14. II. 25 | No. 7 3. II. 25 | No. 9 4. II. 25 | No. 32 30. VI. 25 | No. 33 30. VI. 25 | No. 34 30. VI. 25 |
|---|---|---|---|---|---|---|---|---|
| | 2—2½ m high | | | ½ m high | | | | extremely dense |
| — | 4—5.5 | 1.2[12]) | 3.5 | 2.3 | 1.1[14]) | + | 2—3.2 | 4—5.5 |
| — | — | — | — | 1.2 | — | + | 2—3.2[20]) | — |
| — | — | — | r.1 | — | — | — | r.1 | — |
| — | — | — | — | — | — | 1.2[17]) | — | — |
| — | 1.1 | — | — | + | — | 1.2[18]) | 1.1 | — |
| + | — | — | — | — | 1.1[15]) | — | — | — |
| 2.3[11] | — | — | — | — | — | — | — | — |
| + | — | — | — | — | — | — | — | — |
| + | ? | 3.2 | + | 2.3 | 2.3 | + | 1—2.1 | 1.1 |
| + | — | 2 ? | + | 3.4 | — | r.1 | — | — |
| | absent | | | | | richly developed | | almost absent |
| — | — | — | — | — | — | 2—3.2 | 3.2 | 1.1 |
| + | — | 2.1 | 2.2 | — | 2.1 | 1.2—3 | — | — |
| — | — | — | — | — | 1.2 | — | — | — |
| — | — | — | — | — | 1.1 | — | + | — |
| — | — | — | — | — | r.1 | — | — | — |
| — | — | — | — | — | r.1 | — | — | — |
| — | — | — | — | — | — | 2.2 | — | — |
| — | — | — | — | — | — | 2.2 | — | — |
| — | — | — | — | — | — | 1.2 | — | — |
| — | — | — | — | — | — | r.3 | — | — |
| — | — | — | — | — | — | 1.2 | — | — |
| — | — | — | — | — | r.1 | + | — | — |
| — | — | — | — | r.1 | — | — | — | — |
| — | — | — | — | — | — | — | — | — |
| — | — | — | — | — | r.1 | — | — | — |
| — | — | — | — | — | — | 1.1 | — | — |
| — | — | — | — | — | — | + | — | — |
| — | — | — | — | — | — | — | 1.1 }[21]) | — |
| — | — | — | — | — | — | — | 1.1 | — |
| — | — | — | — | — | — | r. 1 | — | — |
| — | — | — | — | — | — | — | 2.1 | — |
| — | — | — | — | — | — | — | 1.1 | — |
| — | — | r. 1 | — | — | — | 1.1 | 2—3.1 | — |
| — | — | — | — | — | — | — | — | — |
| — | — | — | — | — | — | — | — | — |
| — | — | — | — | — | — | — | — | — |
| — | — | — | — | — | — | — | — | — |

TABLE III *(continued)*

| No. of observation and date | No. 25 27. VI. 25 | No. 29 27. VI. 25 | No. 28 27. VI. 25 | No. 2 1. II. 25 | No. 3 1. II. 25 |
|---|---|---|---|---|---|
| **Mosses and lichens:** | no record | no record | no record | Lichens on the trees only. Mosses cover $^3/_4$ of the surface and the lower part of the trunks | Neither lichens nor mosses are seen; whole surface covered with dry leaves |
| *Neckera crispa* | | | | | |
| *Thamnium alopecurum* | | | | | |
| *Anomodom viticulosus* | | | | uncollected | |
| *Usnea florida* | | | | + | |
| *Usnea syriaca* | | | | | at 600 m |
| **Creepers:** | abundant | scarce | absent ? | abundant | absent |
| *Hedera colchica* | 2.1—2 | — | — | 2.3 | — |
| *Smilax excelsa* | — | — | — | — | — |
| *Clematis Vitalba* | — | — | — | — | — |

[1]) *Platanus orientalis* in the beech-wood must be considered as accidental, for it grov generally in the bed of the streams. It is to be found only in the part of the beech fore nearest to the bottom of the valleys.

[2]) Probably *Rubus tereticaulis* P. J. Müll., *R. serpens* Whe and *R. tomentosus* Borkh for all three grow in great abundance in the bed of the valleys, often but several metr lower down than the described communities.

[3]) Same species as grows in the oak forests.

[4]) Probably either *Campanula persicifolia* L. or *C. latiloba* DC. (both were collecte in the forests of Cham-Dagh).

[5]) Only 10 m in height.

[6]) Was met with a little lower down (255 m) as a shrub 2½ m high.

[7]) Many leaves of beeches are attacked by fungi.

[8]) Keeps near to the stream.

[9]) In clefts of sandstones and slates.

[10]) Probably it would be more correct to join this record to those of oak-forests; f this speaks the presence of oak itself, and still more the total lack in the undergrowth *Rhododendron* and *Prunus*, and the presence of *Erica*, *Arbutus* and *Genista*, which specie are constant components of the stratum of shrubs in the oak-woods throughout the mountains.

[11]) At this time of year the shrubs of *Genista Lydia* still retained a few green leav at the tops.

[12]) Stunted shrubs in small groups occupying the depressions only.



TABLE III

| No. 30 6. II. 25 | No. 14 14. II. 25 | No. 31 14. II. 25 | No. 7 3. II. 25 | No. 9 4. II. 25 | No. 32 30. VI. 25 | No. 33 30. VI. 25 | No. 34 30. VI. 25 |
|---|---|---|---|---|---|---|---|
| absent | Mosses and lichens absent, $^9/_{10}$ of the surface covered with dry leaves | | Surface deeply covered with dry leaves; mosses at the bases of trees and on their bark | | Wood-floor devoid of mosses | Mosses on the bark of trees | |
| — | | | | | | + | |
| — | | | | | | + | |
| — | | | | | | + | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | very abundant | |
| | 2.3 | — | 2. ? | 2.3 | r. 1 | 2—3.2 | + |
| | — | — | — | — | — | 1.2—3 | — |
| | — | — | — | — | 1.1[19]) | — | — |

[13]) Observations No. 14 and 31 were made in the same forest only several metres distant from each other, where the angle of incline changed abruptly from 10° to 40° and the exposure — from the north-western to the north-eastern. The latter spot was besides more sheltered than the former. Sudden increase in the quantity of *Rhododendron ponticum* was striking.

[14]) Miserably looking shrubs.

[15]) On the slope facing to the south.

[16]) This forest contained many more species in the ground stratum than are given in the list, but some of them were uncollected (because of the lack of flowers and fruits), other were spoiled by the rain and during the transport, therefore remained undetermined (as it seems, some representatives of *Primulaceae* and *Violaceae*).

[17]) Huge shrubs, about 8 m high, stems having 15 cm in circumference.

[18]) 2 m in height.

[19]) Probably we had to do in this spot with a true virgin forest, for climbers reached there not only great length (climbing up to the top of the highest trees), but *Clematis Vitalba* in its lower part possessed of stems 30 cm in circumference, and *Smilax excelsa* in the opposite part of the valley (No. 33) were seen growing in such an abundance as nowhere before or after.

[20]) *Prunus Laurocerasus*, although limited to beech forest, keeps to the lower parts of the valleys, forming two strips along the stream, and not going up the slope more than 30—40 m.

[21]) Both growing only at the immediate proximity of the stream.

Innumerable ferns embellish the rocks near the water. We noticed among them: *Scolopendrium officinale*, *Athyrium Filix femina* f. *fissidens*, *Aspidium aculeatum*, *Aspidium lobatum*, *Aspidium Filix mas*, *Polypodium vulgare*. and occasionally *Asplenium nigrum* (for the list of species see Table IV).

In the places where the valley has already reached a more advanced stage of development, that is when the cross section approaches the shape of an U, where there is more space on the bottom, outside the water on the alluvial sediments, the mixed forest gives place to one more society, no less attractive — to the society of *Petasites officinalis* and *Datisca cannabina*. The former surpasses human height (Pl. VII, Phot. 13, 14), the latter is about 3—5 metres in height and both keep near to the bed of the stream. *Datisca cannabina*, reminding us of the hemp, has a very elegant appearance thanks to the bent stems and hanging flowers and fruits. — The forest itself, on this more sunny spaces acquires some additional species — as *Platanus orientalis* and *Ficus Carica* (rare), and *Clematis Vitalba* completely entangles the trees and shrubs. Occasionally *Hypericum Androsaemum* is to be seen (shrubs of medium size).

In still more wide places of the deep shady valleys several species of *Rubus*[1]) form dense thickets, in places again *Lysimachia verticillata* and *Sambucus Ebulus* form pure societies with the frequent addition of *Calystegia silvestris* and *Humulus Lupulus*. Here and there *Telekia speciosa* with its yellow flowers brightens the view.

The presence of a waterfall adds to the great variety in the shady wooded ravine of Su-Atak-Dere (Pl. I. Phot. 2). The quantity of water in summer time is probably less than half that in winter. If the waterfall is not very imposing in summer, the vegetation covering the vertical wall (about 12 m high), from which the stream rushes down, bears species which had been not found by me otherwise.

The waterfall is bordered on both sides by a belt, about 1—1$^1/_2$ m in width, consisting of *Saxifraga Cymbalaria*, *Brachypodium silvaticum* and some moss. Still farther from the waterfall, yet on the same rocky threshold, were met: *Festuca montana* and some hepatics and mosses, among which grew *Campanula latiloba*, *Trachystemon orientale*, *Aspidium Filix mas*, *Scolopendrium officinale*, *Geranium Robertianum*, *Cirsium hypoleucum*.

[1]) We collected here: *Rubus procerus* var. *sanctiformis*, *R. tereticaulis* var. *argutipilus*, *R. serpens* var. *longisepalus*, and var. *spinulosus*, *T. tomentosus* var. *glabratus*. They proved a very convenient and springy mattress for those, who incautiously fell down from their horses!

While distinguishing and limiting the beech communities found on the slopes and crests of the Cham-Dagh is comparatively an easy matter, when we try to do the same with the vegetation of the bottom of valleys and ravines[1]) we find it much more difficult, for there is a transition, on the one hand when ascending the steep slopes, where *Fagus orientalis* has for undergrowth — instead of *Rhododendron ponticum* — *Prunus Laurocerasus*, on the other hand — when moving up the stream: two strips of alluvial grounds, which accompany the stream and on which develop must picturesque society of *Petasites-Datisca*, of *Rubus* spp., *Pteris aquilina* or *Lysimachia verticillata*, become narrower and narrower until they totally desappear, leaving no space either for the tall herbs or trees proper to the lower course of the stream (*Platanus*, *Ulmus*, *Carpinus*, and so on). *Fagus orientalis* — in the very bottom of the stream is represented only by small saplings or seedlings and is very seldom met with as a tree. But at the immediate proximity — beginning with the scarp — it forms pure (or mixed with *Carpinus Betulus* — in the part nearer to stream) stands. Other trees, as *Platanus*, *Carpinus*, *Ulmus*, *Salix*, *Alnus* etc., although constantly present, being scattered by small groups or single individuals, play decidedly less important part, as well physiognomically as phytosociologically, than the thickets of tall herbs[2]) and shrubs. As these thickets consist in one place nearly exclusively of *Rubus* spp., in others — of *Prunus Laurocerasus*, and most often of *Petasites officinalis* with *Datisca cannabina*, it is not clear for me — have we to distinguish here several "societies" constituting the components of the one association only, or *Petasitetum officinalis* with *Datisca* is to be considered as an association, the thickets of *Rubus* spp. as an another and so on.

As to the beech forest with the undergrowth of *Prunus Laurocerasus* — I feel inclined to consider it as a facies of *Fagetum rhododendrosum*, which facies develop near the bottom of valleys and in the uppermost part of them, that is — in the most sheltered and humid localities. Only 40—50 m above the bottom *Prunus Laurocerasus* is replaced by *Rhododendron ponticum*. This exchange occurs gradually, and *Rhododendron* is to be found also in the lowermost part above the bottom, yet in insignificant quantity.

The coniferous trees are represented in Cham-Dagh by two species of pine: *Pinus nigra* Arnold var. *Pallasiana* Antoine and *Pinus silvestris*

*(continuation on p. 35)*

[1]) All notations obtained for stream-communities are confronted in Table IV.

[2]) Rübel's "Altherbosa" (see 64, p. 17).

TABLE IV

## VEGETATION OF THE BOTTOM OF THE VALLEYS AND AND KURMALY-DAGH

| Locality | Isak-Oglu-Dere (Phot. 11, 12) | Takhtalyk-Dere | Su-Atak-Dere (lower course) | Su-Atak-Dere (lower course) |
|---|---|---|---|---|
| No. of observation and date | No. 26[5]) 27. VI. 25 | No. 4[7]) 2. II. 25 | No. 37 6. II. 25 | No. 22[9]) 26. VI. 25 |
| **Ecological characteristics** | | | | |
| Altitude, m. above sea-level | 250—255 | 270 | 390 | 400—450 |
| Trend of valley . . . . . | NE—SW | NNE—SSW | SW—NE | NW—SE |
| Exposure to winds . . . . | sheltered | sheltered | — | — |
| Character of bottom. . . . | narrow with very steep slopes | in this lower part — flat | rather thick cover of snow | narrow with extremely steep slopes (to 45°) |
| Subsoil and soil. . . . . . | sandstone | — | — | — |
| **Phytosociological characteristics** | | | | |
| Vitality (presence of seedlings) | richest young growth displays *Carpinus*. saplings of *Tilia* and *Castanea* are also numerous | no record | no record | seedlings of *Castanea* |
| **Stratification and floristic composition** | | | | |
| Tall-tree stratum: | | | | |
| *Carpinus Betulus* . . . . | 2.1 | — | + | 2.2 |
| *Platanus orientalis* . . . | 1.1 | — | + | 1.1 |
| *Castanea vesca* . . . . . | 1.1 | — | — | + |
| *Ulmus scabra*[1]) . . . . . | + | — | + | 1.1 |
| *Fagus orientalis* . . . . | — | — | + | — |
| *Tilia tomentosa*. . . . . | 1.1[6]) | — | — | — |
| Small-tree stratum: | | | | |
| *Alnus glutinosa*[2]) . . . . | + | — | — | 1.1 |
| *Staphylea pinnata* . . . | + | — | — | r. 1[10]) |
| *Salix alba* . . . . . . . . | + | — | — | 1.1 |
| *Evonymus latifolia* . . . | — | — | — | — |
| *Ficus Carica* . . . . . . | r. 1 | — | — | — |

TABLE IV

**THE FOREST OF THE GORGES IN THE CHAM-DAGH (BITHYNIA).**

| Su-Atak-Dere (below the waterfall, Phot. 13, 14) | Su-Atak-Dere (above the waterfall, Phot. 15) | Ulu-Dere (middle course) | Ulu-Dere | Hussein-Sheikh-Dere | Bichki-Dere (Kurmaly-Dagh) |
|---|---|---|---|---|---|
| No. 23 26. VI. 25 | No. 24 26. VI. 25 | No. 21[15]) 26. VI. 25 | No. 12[18]) 10. II. 25 | No. 8 4. II. 25 | No. 36 30. VI. 25 |
| 465 | 520 | 371 | 371 | 433 | 300 |
| NW—SE | NW—SE | N—S | N—S | NW—SE | N—S |
| sheltered | sheltered | sheltered from N, E and W | | sheltered | sheltered from S, E and W |
| exceedingly narrow and shady | the bed has less than 3½ m in width | rather wide flat space at the outlet of the Okhlamurluk-stream to Ulu-Dere | | narrow, shady ravine with rotten logs lying across it | flat and rather wide |
| — | — | deep alluvial soil | | — | deep alluvial soil |
| no record | no record | seedlings of *Castanea* | | no record | numerous saplings of *Platanus* |
| — | — | 1.1 | 1.1 | + | + |
| — | — | r. 1[16]) | r. 1 | + | 2.1—2 |
| — | — | — | — | + | — |
| — | — | — | — | — | + |
| — | +[12]) | + | — | + | — |
| — | — | — | — | — | — |
| 1.1 | — | — | — | — | + |
| — | — | — | — | — | + |
| — | — | — | — | — | — |
| — | — | + | — | — | — |
| — | — | — | — | — | — |

TABLE IV *(continued)*

| No. of observation and date | No. 26 27. VI. 25 | No. 4 2. II. 25 | No. 37 6. II. 25 | No. 22 26. VI. 25 |
|---|---|---|---|---|
| **Shrub stratum:** | | | | |
| *Corylus Avellana* | + | +[8]) | + | 1—2.1 |
| *Prunus Laurocerasus* | + | + | + | — |
| *Rhododendron ponticum* | + | + | — | — |
| *Sambucus nigra* | — | — | + | 1.1 |
| *Hypericum Androsaemum* | 1.1 | — | — | 1.1 |
| *Ilex aquifolium* var. *angustifolium* | 1.1 | — | — | — |
| *Mespilus germanica* | — | — | — | — |
| *Rubus procerus* var. *amiantinus* | — | — | — | — |
| *Rubus* spp.[3]) | 2—5.1—4 | + | — | 1.2 |
| *Salix incana* | — | — | — | — |
| *Hypericum calycinum* | 1.1 | — | — | — |
| **Tall-herb stratum:** | | | | |
| *Petasites officinalis*[4]) | 2—5.4—5 | — | — | 4.4 |
| *Datisca cannabina* | 2.4 | 1.1 | — | — |
| *Pteridium aquilinum* | — | — | — | — |
| *Telekia speciosa* | — | — | — | 1.2 |
| *Lysimachia punctata* var. *verticillata* | — | — | — | — |
| *Sambucus Ebulus* | — | — | + | — |
| *Valeriana alliariaefolia*? | — | + | — | — |
| **Ground stratum:** | | | | |
| *Trachystemon orientale* | 2—3.2 | — | — | 1—2.2 |
| *Calamintha grandiflora* | — | — | — | — |
| *Sanicula europaea* | 2.2 | — | — | — |
| *Urtica dioica*? | — | — | — | 2.1 |
| *Lactuca muralis* | 2.1 | — | — | — |
| *Viola* sp. | 2.1 | — | — | — |
| *Euphorbia amygdaloides* | 2.1 | — | — | — |
| *Dentaria bulbifera* | 1.1 | — | — | — |
| *Festuca montana* | 2.1 | — | — | — |
| *Cardamine impatiens* | 1.2 | — | — | — |
| *Asarum europaeum* var. *caucasicum* | — | — | — | — |
| *Brachypodium silvaticum* | — | — | — | — |
| *Geranium Robertianum* | — | — | — | 1.1 |
| *Ruscus hypoglossum* | — | — | — | — |
| *Epilobium lanceolatum* | — | + | — | — |
| *Epilobium parviflorum* | — | — | — | — |
| *Circaea Lutetiana* | — | — | — | — |
| *Carex remota* | 1.1 | — | — | — |
| *Carex maxima* | — | — | — | — |

TABLE IV

| No. 23 26. VI. 25 | No. 24 26. VI. 25 | No. 21 26. VI. 25 | No. 12 10. II. 25 | No. 8 4. II. 25 | No. 36 30. VI. 25 |
|---|---|---|---|---|---|
| 1.1 | 1.1 | 1.1 | 1.1 | + | + |
| 3.4 | 2—3.4[13]) | 2—4.2—3[17]) | 4.3—4 | + | + |
| — | 3.4—5 | r—3.1—2 | +[19]) | + | — |
| — | — | — | — | + | — |
| — | — | — | — | + | + |
| | | | | | |
| — | — | — | — | — | — |
| — | — | — | — | — | + |
| | | | | | |
| — | — | — | — | — | 3.1 |
| — | 3.1 | 3.2 | 3.2 | + | ? |
| — | — | — | — | — | + |
| — | — | — | — | + | — |
| | | | | | |
| 3—4.3[11]) | — | + | 2.1 | 2.3 | + |
| — | — | — | — | r. 3 | — |
| + | — | 2—3.2 | + | + | — |
| — | — | 2.2 | — | ? | 3.2 |
| | | | | | |
| — | — | 3.4 | — | — | ? |
| — | — | — | — | + | — |
| — | — | — | — | + | ? |
| | | | | | |
| 2.2 | 2—3.1 | 3—4.4 | — | — | — |
| 1.1 | 2—3.1 | 2.2 | 2.3 | — | — |
| — | — | r. 1 | — | — | — |
| 1.1 | — | r. 2 | — | — | — |
| 1.1 | — | — | — | — | — |
| — | — | — | — | — | — |
| — | — | — | — | — | — |
| 1.1—2 | — | — | — | — | — |
| — | + | 1.1 | — | — | — |
| — | 1.1 | — | — | + | — |
| | | | | | |
| 2.2 | — | 1.2 | 2.1 | — | — |
| — | — | 2.2 | — | — | — |
| 2.2 | — | — | — | — | — |
| r. 1 | r. 1 | — | — | — | — |
| — | — | — | — | — | — |
| — | — | — | — | ? | — |
| — | — | — | — | ? | — |
| — | + | — | — | — | + |
| — | + | r. 1 | — | — | — |

TABLE IV *(continued)*

| No. of observation and date | No. 26 27. VI. 25 | No. 4 2. II. 25 | No. 37 6. II. 25 | No. 22 26. VI. 25 |
|---|---|---|---|---|
| Ground stratum: *(cont.)* | | | | |
| *Hypericum Montbretii* . . | — | — | — | r. 1 |
| *Digitalis ferruginea* . . . | + | — | — | — |
| *Polygonatum* sp. . . . . | — | — | — | — |
| *Veronica Chamaedrys* . . | r. 1 | — | — | — |
| *Sedum glaucum* var. *bithynicum* . . . . . . . . | — | — | — | r. 1 |
| *Arum Nickelii* . . . . . | — | — | — | — |
| *Saxifraga Cymbalaria* . . | — | — | — | — |
| *Scolopendrium officinale* . | — | — | + | — |
| *Aspidium aculeatum* . . | — | — | + | — |
| *Aspidium Filix mas* . . | 1.1 | + | — | 1.1 |
| *Aspidium angulare* . . . | + | — | — | — |
| *Aspidium lobatum* . . . | — | — | — | + |
| *Polypodium vulgare* . . | — | — | — | — |
| *Asplenium Adiantum nigrum* var. *Virgilii*. . . | + | — | — | — |
| *Athyrium Filix femina*. . | 1.1 | — | + | — |
| Bottom stratum (mosses lichens, fungi): | | | | |
| *Mnium undulatum* . . . | — | — | — | — |
| *Neckera crispa* . . . . . | — | + | — | — |
| *Thamnium alopecurum* . | — | — | — | — |
| *Isothecium viviparum* . . | — | — | — | — |
| *Anomodom viciculosus* . | — | — | — | — |
| *Pleuropus euchloron* . . . | — | — | — | — |
| *Hypnum cupressiforme* . | — | — | — | — |
| *Catharinea undulata* . . | — | — | — | — |
| *Brachythecium rutabulum* | — | — | — | — |
| *Peltigera horinzontalis* . . | — | — | — | — |
| *Peltigera praetextata*. . . | — | — | — | — |
| *Ramalina calicaris* . . . | — | — | — | — |
| *Usnea florida* . . . . . | — | + | — | — |
| *Usnea bithynica* . . . . | — | + | — | — |
| *Xylaria polymorpha*. . . | — | — | — | — |
| *Geopyxis catinus* . . . . | — | — | — | — |
| *Astraeus stellatus* . . . . | — | — | — | — |
| Creepers: | | | | |
| *Hedera colchica* . . . . | 2.1 | — | + | — |
| *Clematis Vitalba* . . . . | — | — | + | — |
| *Calystegia silvestris* . . . | — | — | — | — |
| *Smilax excelsa* . . . . . | — | — | — | — |
| *Humulus Lupulus* . . . | — | + | — | — |

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|---|---|---|---|---|---|
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| — | — | — | — | + | — |
| — | — | — | — | + | — |
| | | | | | |
| — | + | 1.1 | + | + | ? |
| 2.2 | — | — | — | + | + |
| r. 1 | — | 2.1 | — | — | ? |
| — | — | — | — | — | + |
| — | — | — | — | + | — |

TABLE IV

| No. 23<br>26. VI. 25 | No. 24<br>26. VI. 25 | No. 21<br>26. VI. 25 | No. 12<br>10. II. 25 | No. 8<br>4. II. 25 | No. 36<br>30. VI. 25 |
|---|---|---|---|---|---|
| — | — | — | — | — | — |
| — | — | — | — | + | — |
| 1.2 | — | — | — | — | — |
| — | — | — | — | — | — |
| — | — | — | — | — | — |
| — | — | — | r. 1 | — | — |
| 1.3 | — | — | — | — | — |
| + | 2.1 | 1.1—2 | 2.2 | + | — |
| — | + | — | + | 2.1 | — |
| — | 1—2.1[14]) | 1.1 | — | + | — |
| — | — | — | — | — | — |
| — | — | — | — | — | — |
| — | — | — | 2.1—2[20]) | — | — |
| — | — | — | — | — | — |
| — | — | 2.2 | + | ? | — |

TABLE IV *(continued)*

[1]) *Ulmus scabra* is to be found generally in the upper, narrow and shady part of valleys.

[2]) *Alnus* is found in the valleys of the Cham-Dagh in the form of middle-sized trees.

[3]) The numbers for the abundance and the way of occurring are given for the following species of *Rubus* taken together: *R. tomentosus* Borkh., *R. tereticaulis* P. J. Müller, *R. serpens* Whe., and *R. procerus* P. J. Müll.

[4]) In the upper part of valleys, where they are but 3—10 m in width, the leaves of *Petasites* attain huge dimensions (80 × 50 cm).

[5]) The distribution of trees throughout this community is very uneven: in wider places they grow isolated, leaving the strip at the water to *Petasites* and *Datisca* or to sunny open spaces; a little apart from the water *Pteridium aquilinum* and *Rubus* spp. grow in dense crowds; in the upper course, where the valley becomes very narrow, the trees covering the slopes (chiefly beech) mingle with their crowns with those of the bottom of the valley (*Carpinus* and *Platanus*), forming a dense canopy under which the above herbs and shrubs do not develop. In such excessively shady places were found isolated specimens of *Dentaria bulbifera* and *Sanicula europaea*.

[6]) Saplings only.

[7]) The record applies to the lower portion of valley, which part is situated outside of the forest zone. Most probably once the forest extended as far as this spot: in favour of this speaks the presence of *Rhododendron ponticum* (with two species of *Usnea* on its bark) and of *Datisca cannabina*. The latter species, as well as met with in the same locality *Valeriana* (*allariaefolia* ?) and *Epilobium* were devoid of green leaves, and determined after the seeds and fruits.

[8]) Just in full blossom.

[9]) The list given below contains plants met with on the distance of about 3 km along the bed of right-sided (nearer to Hendek) tributary of the Ulu-Dere.

[10]) Here a shrub.

[11]) *Petasites* is about 1 m high and grows only in the places unshaded by the trees.

[12]) *Fagus* and *Rhododendron* form the woods on both slopes to the stream, therefore, speaking truly, they do not belong any more to the species characteristic of the bottom of the valleys. As the valley is here quite narrow and the dense canopy of beeches creates excessive shade, not any representative of trees usually met with in the bottom of valleys is present. Also *Petasites* does not reach up here (it was not more noticed above 500 m altitude).

[13]) *Prunus* grows in two belts on both sides of the stream: it reaches here 3 m in height.

[14]) About 1 m in height.

[15]) Beech forest descends down the slopes to the very border of the rivulet.

[16]) A huge tree, rotten inside, having about 4 m in circumference.

[17]) In places — pure thickets 2 m in height.

[18]) This is the winter aspect of the locality described under No. 21.

[19]) It grows sparse in the very bottom of the valley, but becomes at once more abundant where the slope begins.

[20]) On the surface of the ground, and also on the trunks of *Platanus* and *Carpinus*.

L. var. *subalpina* Fom.[1]). On account of insignificant height of the whole massif (about 900 metres) there is no special belt (region) consisting of coniferous forest. Both pines are to be found in the central part of the massif at the height of about 740 m where they constitute either small patches of pine-tree forest among deciduous forests, or are intermixed with them (Pl. VIII. Phot. 16). Our picture represents two fine specimens of *Pinus nigra* var. *Pallasiana* on the slope with the north-western exposure; they are about 25 metres in height. *P. silvestris* is seen on the opposite slope. but it is intermixed also with the former. In the undergrowth are to be found *Quercus* sp. (1—8 m in height), *Erica arborea, Genista Lydia*. *Rhododendron ponticum* is also present at this height, but more often is found keeping close to a brook, where it is accompanied by *Ilex aquifolium*. — Although we find already pine-forest at the height of 740 metres, it does not mean that the vertical limit of the distribution of beech-forests in already attained. Thus our Pl. IV, Phot. 7 represents pure beech-forest at the height of 850 metres, quite near to the summit of Cham-Dagh and to the above described groups of pine-trees. The summit itself represents a very sad picture, as the forests are completely destroyed by the fire and hatchet. It is difficult even to remark that one is standing on the highest spot of the whole massif. because the flat crests. dividing the tributaries of Milan-Su (to the east), Sakaria (to the west), Mudurlu (to the south) and Kara-Su (to the north),

[1]) Provided there are no other conifers in the northern section of the massif, which, I repeat, has not been visited by me. Anyhow the geologist Berg, who during a whole week explored just the opposite side of the mountains, i. e. northern one, mentions no other conifer-trees, save pines. — Although I am not much inclined to believe botanical communications made by geologists (one of them reported *Pinus Pinea* from the central part of Anatolia, another — birch-tree from Northern Paphlagonia — from the mountains between Ilgaz-Dagh and Ineboli!), but the notes contained in Berg's "Geologische Beobachtungen . ." (p. 469—470) seems to me reliable. and being the only one from the district of Cham-Dagh — worth quoting. He writes: "Es bedecken ihn zum Teil ungeheure Urwälder von Buchen, Platanen, Kastanien und Fichten". In the following lines he describes the difficulties in moving among fallen trees and thickets of rhododendrons entwined with *Hedera*. We read farther on: "Das Klima ist feucht und rauh und vor allem reich an heftigen Gewittern. die von Norden, vom Schwarzen Meere hereinkommend, sich in den Waldestälern fangen und ihre ganzen enormen Wassermassen mit einmal entladen. Die große Breite und die großen Geschiebemassen der Flußbetten hätten mir dies schon genug bezeugt . . ." It is clear enough from these few notes that the vegetation of the northern slopes, as concerns its composition, is much the same, as in the part explored by us, but probably it is still more luxuriant, being developed on the side of the mountains exposed to rain bearing winds.

rise very gradually and being densely wooded do not allow of large views. It is from the summit of Cham-Dagh only that one gets a glimpse of the sea. One of the summits to the north-east, densely clad in the deciduous forests, seems to be no less high than Cham-Dagh.

The view one gets when going from Hendek to the summit of Cham-Dagh shows us once more, that the whole massif represents a mountain-system having the character of Central-European mountains, that is with flattened and rounded forms. Berg's remark about the crests and summits of Cham-Dagh being peneplainised seems to be confirmed also in the southern part of the mountains, evidently (judging from the map he added to his paper) not visited by him. The impression of being "in the mountains" is much stronger when one looks around not from the summits, but from the bottom of valleys. The energetic erosion of recent times has created deep valleys with very steep slopes. The whole massif declines obviously to the south-west, but the impression of being "in the mountains" is no less in this part, because the streams erode here, as it seems, with still greater force than in the central part, deepening the valleys (for example that of Isak-Oglu-Dere — in its middle course) to the level but of 150—200 m.

**Bichki-Dere (Kurmaly-Dagh).** We had the opportunity to enter the region of deciduous forest once more in another place in Bithynia, namely in the mountains, which represent the continuation to the east of the chain running between the gulf of Ismid and the gulf of Gemlik (Penck has named it "Ismid Kette", see Fig. I p. 3 of his "Die tektonischen Grundzüge Westkleinasiens"). What is its real name between the river of Sakaria and its right tributary Mudurlu, one cannot guess when looking at the map of Asia Minor by Kiepert (1 : 400000): the nearest named mountain chains are Ak-Sofu and Kurmaly-Dagh. The valley of Bichki-Dere, visited by us, lies somewhere on the southern slopes of Kurmaly-Dagh (the inhabitants, when asked the name of the nearest mountains, told us Gök-Dagh).

The way from Hendek to Bichki-Dere, a small village situated at the entrance of the valley of the same name, runs again through the plains of Ak-Ova, with which we had already become acquainted when going from Ada-Bazar to Hendek. Again vast swamps were passed (but not such extensive ones as in the lowermost part — only 30 m altitude — on the mid-way between Ada-Bazar and Hendek). Some places are used for the cultivation of rice. When approaching the mountains, at the altitude of about 130 metres, fields of wheat and oats were noticed. Very dense shrub vege-

tation along the road, consisting chiefly of *Pyracantha coccinea*, *Rubus* spp., *Cornus*, *Viburnum*, accompanied by *Tamus communis*, *Calystegia*, *Clematis alba* and *C. Viticella*. rich fruiting specimens of *Arum Nickelii* (?) did not allow us to investigate more thouroughly the character of spaces we passed. — After Akjazy, the largest settlement which one meets on this way, one is obliged to pass (without bridge) the rather turbulant river of Mudurlu and some of its tributaries. They have very clear water and on the banks great deposits of boulders, showing that in the spring-time the level and the amount of water must be very considerable. After passing Akjazy one notices a great change in the atmosphere: the lungs inhale the damp air with delight, reminding one of the mountain air of our Central European mountains. Soon the vegetation confirms this change: vast meadows, full of grasses and forbs, occupy the deep soils accumulated on the alluvium of the river Bichki-Dere, which is a rather large left-side tributary of Mudurlu. The village itself, situated at the entrance to this valley, at about 200 m altitude, has for inhabitants refugees from the Caucasus, the Cherkesh. On the whole, the population of Ak-Ova (Ada-Bazar, Hendek, and the base of the chain Kardüz-Yaila, Kurmaly-Dagh) consists chiefly of the Caucasian, the so-called Laz and Cherkesh tribes, who with their unscrupulous, war-like character (making travel in this country not quite safe!) brought from their native land their custums, as for instance the use of the buffalo, as an animal of work. The abundance of the swamps on the plains of Ak-Ova suits the habits of these animals very well: spending their free time quite buried in the mud (the cooling effect joined with that of safety against the bites of flies and so on).

We had no more time for this valley that half day. Unfortunately this short time was spoiled a little by a shower, which made still more difficult the hurried putting into the presses the numerous plants (many of which were quite new to me) collected in this beautiful valley.

After passing the meadow, on which especially abundant *Galega officinalis* was noticed, we entered the proper valley[1]). In its bed I noticed fine specimens of *Platanus orientalis* surrounded by crowds of young ones, *Staphylea pinnata*, *Alnus glutinosa*, large trees of *Carpinus Betulus*, *Mespilus germanica* and great abundance of *Corylus*. Big shrubs of a very fine *Rubus* (*R. procerus* var. *amiantinus*) with large dark-pink

[1]) The fact that the valley of Bichki-Dere is said to be used by contrabandists of tobacco for transporting this precious product from Hendek to the interior part of Anatolia indicates its remoteness.

flowers, standing each apart, and having elegantly bent branches, embellished the vegetation. Along the water the *Petasitetum* is again developed. We noticed no *Datisca* here (probably in the more narrow upper part of the valley it exists), but instead of it great amount of *Telekia speciosa*. But our chief attention was drawn to the forest again.

The very steep slopes, making an angle of 35°, are covered on both sides by beech-forest. Again two varieties of this forest could be distinguished. The first kind is developed on rocky subsoil of sandstones on the right sloping to the rivulet, having western exposure, at 302 m altitude. The upper layer consists of beech having a circumference of 2 metres and growing rather distant from each other. They are surrounded by a crowd of young beeches. We noticed with the beech hornbeam and *Platanus orientalis* (the latter seems to be confined to the part of the slope nearest to the bed of the valley). The undergrowth consists of the huge shrubs of *Corylus Avellana* (some of their stem having a circumference of 15 cm), *Prunus Laurocerasus*, *Ilex aquifolium*, *Rubus* sp., *Rhododendrum ponticum* (in small quantities). These shrubs, growing on a very steep slope (35°!), on a shallow humus soil among which here and there the rock of sandstones is seen on the surface, leave enough space and light for the herb-vegetation, having here a much richer composition than in the Cham-Dagh. We see here in great quantities *Trachystemon orientale* and *Epimedium pubigerum*, both very typical representatives of the so-called South-Euxine (or Colchic) element, at this time of the year (June) already devoid of flowers; and then come *Viola hirsuta*, *Gentiana asclepiadea*, *Hypericum calycinum*, much *Primula acaulis* (also but leaves), and some other plant — with the leaves resembling the primrose but the flower-buds strictly pressed to the surface of the ground[1]), and others. But the chief new feature in the vegetation of this valley, the feature which would entrance not only the botanist but every artist and lover of nature, consisted in the splendid development of creepers. Our common *Clematis Vitalba* looks here like something exotic on account of the very thick stems (about 30 cm in circumference!), hanging in the lower part like a bunch of ropes, strong enough to support the rocking of a grown up person. They climb up to the top of the trees. — The ground is devoid of mosses, instead of which dry leaves fill up the spaces between the sandstone rocks and herb-vegetation.

The second kind of the beech-wood we find on the other side of the same valley. At the same altitude of 302 m, in a flat ravine in which

[1]) Unfortunately this curious plant has been quite destroyed while drying it in the press.

a small brook (left-side tributary to the main stream) flows, the outcrops of granites and limestones were noticed. The beech forest is no less attractive here. On the slope to the brook, having south south-east exposure, we noticed in the layer of trees *Fagus orientalis*, *Staphylea pinnata*, *Ulmus scabra*, *Castanea sativa*, all entwined with creepers, among which *Hedera colchica* and the pricky *Smilax excelsa* were more richly developed, being in length here no less 10—15 metres. Near the water we collected a lot of ferns and a species of *Carex*, which thanks to the unusual (pale bluish-green) colouring of the leaves and spikes drew my attention at once and was mentioned in my travel-notes as a "strange *Carex*". It proved afterwards to be *Carex Grioletii*, a species having a very scattered distribution: from Persia to Transcaucasus and Lasistan (Trapezunt), and isolated stations in Italy (Liguria) and Spain. Our new locality, in Bithynia, which lies in midway between the eastern part of the area and Italian-Spanish area, shows clearly, that we have to deal with an old species, which has diminished its area. But let us return to the forest. — In the undergrowth, farther from the water, we found *Prunus Laurocerasus* and on the slope to the main stream, with eastern and north-eastern exposure, dense thickets of *Rhododendrum ponticum*, allowing but sporadic occurrences of *Scolopendrium vulgare* and *Trachystemon orientale*.

The difference in the composition of the beech-forest in the above examples is accounted for probably more by the exposition than the character of the substratum. We see, that both types find their corresponding communities in the mountains of the Cham-Dagh. The former — rich in herbs (for full list of species see Table III) — is the same *Fagetum herbosum* which occupies in the Cham-Dagh the upper, more exposed part of slopes and crests; the latter — rich in *Rhododendron* and *Prunus* — is *Fagetum rhododendrosum*, developed in deep ravines and on sheltered slopes. Here — in the valley of Bichki Dere — both are to be found at the same altitude, only on slopes having different exposures. As areas more rich in *Rhododendron* occur in the Cham-Dagh in the deepest ravines, and in the valley of Bichki-Dere on slopes with north-eastern exposure, we presume that it is the greater dampness of these places which permits this vegetation to develop[1]). It is clear that the ecological conditions restricted in Cham-Dagh to the

[1]) The greater dampness of the air was displayed not only in a richer development of the *Fagetum orientalis* associations, but also in the fact that the only rains which we had during our 7 weeks travel were while we were just in this valley and on the highest summit — in the alpine region of Ilgaz-Dagh.

narrow ravines and valleys (it must be remembered that we speak about the southern section of these mountains) are displayed in Bichki-Dere on a wider space, and probably thanks to the damper climate[1]) the beech-communities have the aspect of being more fully developed.

I was very sorry to be obliged to quit the beautiful valley of Bichki-Dere, which promised rich botanical collections and observations, the more so, since, to the best of my knowledge, it has never been visited by any botanist. I was perfectly conscious of the fact, that many highly interesting plants had to remain uncollected. Leonhard, whose route lay along the Mudurlu valley, close to the locality described by us, writes that both its slopes, up to 1600 m altitude, are densely clad by beech- and oak-forests, and that this part of Anatolia is least explored in Asia Minor (42, p. 215). He draws attention to the fact that the mountains amidst which the Mudurlu flows, that is Ak-Sofu, Kurmaly-Dagh, Kardüz-Yaila, are situated under very favourable conditions for precipitation. The lowland of Ak-Ova, situated to the north of them, presents no obstacle to the north winds, which cause precipitation[2]). In the autumn-time, says he, when one looks at these mountains from Sabanja, their forest clad slopes are constantly hidden in clouds and mist.

With the valley of Bichki-Dere we close the first chapter of our study of the vegetation of Anatolia, as well as the first part of our journey. We hurried across the lowland of Ak-Ova to reach the express train at Ada-Bazar. Botanical observations made from the window of a train are not of much importance, still we noticed that the rich forest-vegetation comes to an end somewhere in the picturesque gorges of Ismid-chain through which the Sakaria forces its way from the interior of Anatolia to the lowland of Ak-Ova. Its bend near Lefke seems to be decidedly the limit of the forest vegetation. Beginning with this the bare rough rocky slopes, limiting the cañon-like valley, bear solitary pine- and juniper-trees. The valley of Pursak, close to which the railway runs, on the second part of the way is more attractive from the view of solitary fantastic rocks and isolated mountain cones, reminding one by their bright colours (white, red, yellow), and sometimes table-forms, of desert

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[1]) R. Fitzner, 21, p. 79.

[2]) We may add that the Cham-Dagh situated to the north — on account of being but 900 metres high — is not likely to represent any important obstacle, which could greatly diminish the dampness of these northern winds; they ultimately precipitate their whole moisture on the much higher chains (about 1800 m) of Kardüz-Yaila, Kurmaly-Dagh and Ak-Sofu, all of which form the continuation to the east of the Ismid-chain.

landscapes. The vegetation is of a steppe type, in more favourable localities replaced by cultivated fields.

Before making acquaintance with the steppe-communities, we find it necessary to add some notes, which arose from the comparison of the vegetation seen by us in Bithynia with the description of the same in the works of others.

For beech forest I obtained 13 observations (Table III); some of them apply to the winter aspect, three — to the valley of Bichki-Dere, in the Kurmaly-Dagh. I have put them together to make direct comparison more convenient. As can be seen from them, the beech-forest (as well as oak-forest) does not attain in Bithynia its full rest in the winter season. There is a whole list of species which retain their green leaves. Another feature which strikes us is the almost total absence of the so-called exclusive species of *Fagetum silvaticae* of Europe. Some of them are to be found in the bottom of valleys — on the narrow belt between the outskirt of the forest (beech) and the border of the stream. We may cite but *Dentaria bulbifera*, *Sanicula europaea* and *Asarum europaeum* var. *caucasicum*. It looks as if these species were chased from the beech forest by the excessive shade of *Rhododendron* and *Prunus Laurocerasus* shrubs. Their absence in the beech communities devoid of *Rhododendron* — named here *Fagetum orientalis herbosum* — is probably explained by a too high degree of dryness, which does not allow these species to establish themselves.

As the "determinants" of *Fagetum rhododendrosum* I shall name: *Rhododendron ponticum*, *Prunus Laurocerasus*, *Hedera colchica* and *Trachystemon orientale*. As we see — three of them are absent in the European beech forests. This speaks in favour of *Fagus orientalis* Lipsky being an independent distinct species from *Fagus silvatica* L. (which till nowadays is doubted by some), with different ecological requirements.

Another beech association distinguished by me — *Fagetum herbosum* — is physiognomically nearer to our European beech-woods, but floristically it is again different. As its "determinants" I shall name *Festuca montana* and *Rubus* spp.: probably *R. tereticaulis* (3 varieties), *R. serpens* (2 varieties), *Rubus tomentosus*, and *Rubus procerus*.

On the Europaean continent we find again (probably) the same communities of the oriental beech in the Stranja mts. in Thrace. Here must be mentioned two papers dealing with the vegetation of this massif: one by Stefanoff (73), describing its northern — Bulgarian part, another by Mattfeld (47), dealing with its southern — Turkish

part. In the list given by Stefanoff for the beech-forest (p. 48) of the northern Stranja we meet with almost all species forming the *Fagetum orientalis* in the Cham-Dagh (although some of the species given by him probably grow in the bottom of valleys, not in the proper beech-forest, for instance I have not met with *Hypericum Androsaemum* outside the bed of the valleys, also *Cyclamen coum* in Bithynia grows in more open localities, being found only exceptionally under the canopy of beech-forest). The remark of the author (p. 67) that: "von den zahlreichen Begleitern der europäischen Buche nur ein sehr geringes Quantum zu finden ist" agrees well with what I have noticed in the beech forests of Cham-Dagh and Kurmaly-Dagh.

As to the description of the beech forests of Stranja by Mattfeld (p. 22—23) it seems most probable that his "Schluchtwald" corresponds with our *Fagetum rhododendrosum* and its facies with *Prunus Laurocerasus*, while the beech forests of the crests and more open spaces, devoid, according to this author, of evergreen undergrowth, will be proved to belong to *Fagetum herbosum*. But for this more detailed lists of species are needed.

On the basis of the floristical composition, the vegetation of the Stranja must be linked to the South-Euxine province[1]) covering the whole of Northern Asia Minor. It would be well to prove that also phytosociologically we have to deal with the same entity. Having in view the great imperfection of the observations made by me on the plant communities of Bithynia (and still more imperfect on the communities of Galatia and Paphlagonia) I hesitated to publish them at all. But the total lack of lists of plants, arranged according to communities, with the marking out of the quantitative relations and the way of occurrence of species, encouraged me to place them at disposal of my colleagues, hoping that this will accelerate the understanding of the associations of Northern Asia Minor and in what relation they stand to these of the other countries around the Black Sea.

[1]) It may be considered proved after the papers by Stojanoff (77, p. 148), Stefanoff (73), and Mattfeld (47, p. 29—34).

# Galatia and Paphlagonia.

**Introduction.** The second half of our summer wanderings in Anatolia took place in the northern part of Galatia and the middle part of Paphlagonia (from its southernmost to its northernmost part).

Our line of route from Ankara to Ineboli was diversified not only by the several days side-trips: in the vicinities of Arab and Kutugun in Galatia, and Tukht in southern Paphlagonia, but also by a longer excursion to mountains of uncertain name (on Kiepert's map — Alfar-Dagh, according to the local name — Khadji-Aghatch), situated between Taschköprü and Sinope, which mountains serve as a river-divide between the tributaries of Geuk-Irmak and the rivulets flowing to the Black Sea.

Ankara itself, where we were obliged to stay 8 days to get documents from the Turkish government allowing of free movement in Anatolia, has been visited by rather numerous botanists (Aucher-Eloy, Tchihatcheff, Wiedemann, Bornmüller, Andrasovszky Krause, and others). This was not the case with other places that we visited: Arab, Tukht, Djazoglu (in the mountains between Taschköprü and Boyabad, on the one hand, and Sinope — on the other;) as far as I know, no botanist has collected there. Generally speaking the botanical exploration of Paphlagonia is very unsatisfactory, and every new place gives an abundant harvest of new species. The most valuable plant collections from the northern part of Anatolia have been brought by: Koch, Wiedemann, Balansa, and Tchihatcheff, who crossed the whole of Northern Anatolia from W to E; in more recent times by: Sintenis, Bornmüller, Handel-Mazzetti, and Manissadjian.

The travels of Wiedemann and Tchihatcheff enriched the West-European herbaria considerably, and the plants collected by Wiedemann, although nearly a hundred years old already, are still in a satisfactory state, and constitute very precious material for those, who occupy themselves with the Northern Anatolian flora. It is to be regretted that there is no description of the travel of Wiedemann[1]).

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[1]) I have tried to reconstruct his probable line of route from the data collected in the "Flora Orientalis".

Wiedemann's journey, judging from some labels accompanying his plants, took place in 1835, i. e. over a 100 years ago. I could not find in the literature

As to the travels of Tchihatcheff: during three out of his eight travels to Asia Minor he crossed Northern Anatolia in several directions, its most westerly and easterly part, although leaving unvisited the central

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any records of his journey, save a few lines in the introduction to the Flora Orientalis (vol. I, p. XIX), which are: "Le docteur Wiedemann, envoyé vers 1840 par le Jardin Botanique de St. Pétersbourg, a exploré la partie septentrionale de l'Anatolie et y formé un riche herbier, dont je dois la communication à l'amitié de M. Regel".

Well collected plants and their conspicuous number in all the chief herbaria of Western Europe, testifying the richness of the collection, call for the question when and under what circumstances the travel was made, which enriched the European museums with the representatives of the flora of Northern Anatolia, till then very little known.

According to "Flora Orientalis", 38 species were collected by Wiedemann in Greece and on some islands of Archipelago (Poros, Syra, Naxos, Tenos, Demonisi, Cyclades, Prasu, northern Euboea, Aetholia), 677 — in Anatolia and near Constantinople. From the latter number nearly one third (224) are cited without giving more precise geographical position (as: Anatolia, Anatolia bor., Bithynia, Paphlagonia, Galatia), which data only serve our purpose in helping to determine the approximate duration of Wiedemann's travel. The remaining 453 species are mentioned as originating from: Constantinople (28), Sabanja (8), Boli (20), Ala-Dagh (21), Hamamly (9), Safranboli (46), Kastamuni (19), Ilgaz-Dagh (13), Mersivan (23), Amasia (22), Topchihan (13), Tokat (68!), Yildiz-Dagh (26), Ankara (36), Dikmen and Elma-Dagh (8 + 5), Beybazar (5), Kadiköi (9), Sojut (8). For other cited localities only 1—3 species are given, which suggests that the collector picked them when passing these places, hurrying on to places which would yield a far more abundant harvest.

The locality farthest to the east reached by Wiedemann is Tokat and the mountains of Yildiz-Dagh, situated at about 50 km to the south-east from that town. As is seem from the very considerable number of plants originating from there (over 80 numbers), the collector probably spent in Tokat a longer time than anywhere else.

To the south — he reached Kaisaria; in Galatia and Phrygia the southernmost localities cited are the province of Haimana (Kadiköi and Haimana) and Kutaia.

It is not difficult to come to the conclusion, that Wiedemann started from Constantinople to Bithynia (Ismid) in the early spring — at the end of February or beginning of March. (Near Constantinople he collected *Romulea Linaresii*, *Muscari racemosum* and *Narcissus*; the first two figure also in our collection, and they were gathered on 22 February!). From Ismid, via the vicinities of lake Sabanja, he reached Boli. The early spring flora originating from these localities proves the truth of such a conclusion (for example near Sabanja he collected *Rhododendron flavum* and *Epimedium pubigerum*, near Boli — *Muscari racemosum* and *Arum "orientale"* — all with blossoms!). — It is not known, if further he started on a side-trip to the Ala-Dagh, or went on strait via Gerede and Hamamli to Safranboli. For the former supposition speaks the pres-

part of the North. The results of his travels were published in a work of seven volumes under the title "Asie Mineure" (81), two of which are devoted to botany. Most unhappily they contain only results concerning

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ence in the list of plants from Ala-Dagh of *Cyclamen coum* and *Primula acaulis*, which plants were collected by us near Hendek, at 300 m altitude, in the flowering state, in the first half of February. (They might have been flowering much later in Ala-Dagh — at the higher altitudes — but in any case in the spring time). The fact that some spring species (*Fritillaria pontica*, *Ornithogalum Wiedemanni*), and *Fagus orientalis* are cited from "Ala-Dagh Szeben" (the data concerning the oriental beech are taken from the unpublished monograph of *Fagus* by Palibine; Boissier does not mention it), gives us another proof of confirming the view that such an excursion could have taken place: the chain Seben-Dagh (Semen-Dagh on the map of Kiepert) is situated to the south from Boli — between this town and Ala-Dagh.

Neither could Safranboli have been reached late in summer, because from this place we saw the specimens gathered by Wiedemann of our new species of *Asphodeline*, named by us in his honour *A. Wiedemanniana*, with flowers only, while the same plant was collected by Sintenis and by us in the mountains of Ilgaz-Dagh (at the altitude over 1000 m) bearing the flowers and wholly developed fruits with nearly ripe seeds in the second half of July.

Further on probably he started by the well known road — via Aratch and Kastamuni (all geographical localities mentioned here are cited by Boissier!) — and from there across the mountains of Ilgaz and Tossia, to Mersivan, Amasia, Tokat. He visited Kastamuni in the second half of June, for one of his specimens, in Herb. Berlin-Dahlem, is labelled: "*Q. sessiliflora*, Kastamuni, 18. VI. 1835". In this part of his line of route we must include Toptcha (or probably more correctly — Topchihan, as I have seen on the label accompanying his specimen of *Cirsium hypoleucum*), because one plant is mentioned from "inter Toptscha et Amassia", but the place itself I did not succeed in finding on any of the available maps.

It is not clear in what way Samsun is to be included in his general route: probably it must be treated as a short side way trip, or possibly Wiedemann started from there back to Constantinople, to make another trip from there to Phrygia, south-western part of Bithynia, Galatia and Cappadocia. On this point we are at a total loss. Especially obscure is the way by which Wiedemann reached Kaisariya and made the parts of his way through, firstly: Torbaly—Terakly—Geive, secondly: Kutaya—Eskishehir—Vezir-Han—Lefke, thirdly: Ankara—Kadikeui—Haimana—Beybazar.

As at our disposal there are but three localities situated on the shore, by which Anatolia could have been entered and left, namely Samsun, Ismid and Ghemlik, and there are no reasonable connecting links between Wiedemann's line of route running through Bithynia, Northern Paphlagonia and Pontus, on the one hand, and Phrygia, South-Western Bithynia, Galatia and Cappadocia on the other; we are bound to suppose that he divided his Turkish excursion into two parts: one, making his starting point Constantinople and Ismid and the end — Samsun, another, again with the same starting point, but ending in Ghemlik. In this way

taxonomy (though they are of considerable value thanks to the original diagnoses by Boissier and Fenzl, which are published nowhere else), all other notes concerning the vegetation are spread throughout all the other parts of the work, and I am sure that it is known to few, that his

all the difficulties mentioned above would be solved in a more or less satisfactory way. — The only possible connecting links betweeen these routes could be: from Boli or Gerede — via Ala-Dagh — Beybazar — to Ankara, and another: from Mersivan — via Karahissar (not Shebbin Karahissar!) to Ankara; but the objection to the first is the very early spring flora of Boli, Semen-Dagh and Ala-Dagh, and the summer flora of vicinities of Ankara; to the second combination contradicts the total lack of any connecting localities on a space of about 250 km between Karahissar and Ankara, which would be quite an incomprehensible thing in case Wiedemann did really cross this country,

So, taking for granted his second trip to Anatolia, we see him following the ancient road from Ismid—Geive—Terakly—Torbaly—Beybazar to Ankara. The 36 species collected by Wiedemann near Ankara testify to an earlier stay there, than was the case with us. For there were no traces of such plants collected by him as: *Saponaria prostrata, Arenaria Ledebouriana, Hedysarum varium, Jurinea anatolica, Acanthus hirsutus* etc. in the first days of July, when we reached this spot. On the other hand we found them in full blossom at a higher altitude (1300 to 1500 m) in the mountains situated to the north from Ankara, in the first half of July. Therefore he probably stayed in Ankara in June.

If the excursion to Cappadocia is not a mistake (only three plants cited from Kaisariya and not one from Cappadocia!) we stand before a missing link, feeling quite incapable to fill it up. Might it not be that Regel (Petrograd), when communicating to Boissier about the collection of Wiedemann, omitted some of his plants which could fill up these gaps?

His way back probably lead by Haimana—Kadikeui—Eskishehr—Kutaya (or vice versa!)—Sojut—Vezir-Han—Lefke—Keshish-Dagh (Brussa?)—Ghemlik. To Greece he probably started after finishing his Turkish excursions. Anyhow the list of plants collected by him both in South-Western Bithynia, Lesser Phrygia and in Greece (chiefly the islands) shows on the one hand very few species, and on the other the lack of spring species. (We must not forget, however, that about 224 of his species bear no precise details as to the locality on the labels). These two facts confirm our supposition that both parts belonged to the final stage of his long journey. How long? Supposing, that under the very fatiguing conditions in which travellers work in Turkey (lack of good hotels, excessive heat, drought, often unfriendly disposition of the natives, lack of good communications — the railroads even now covering but a comparatively small part of country) — which conditions must have been much more difficult a 100 years ago — supposing then, that during one day it is possible to collect 20—25 specimens (our rate) — his travel must have lasted at least 2 months, but probably much longer; we shall come to nearly the same numbers by dividing the approximate length of his route-line, which is about 2500 km, by the average number of kilometres traversed by day in travels of such a kind, that is by 30—40 km. The result is 2—3 months (not counting the days of stopping).

"Geologie" (4 volumes out of the 7 of "Asie Mineure") is full of interesting notes on the vegetation[1]) of the parts of Anatolia visited by him. Save this — there exists a pamphlet by Tchihatcheff on vegetation, namely "Etudes sur la végétation des hautes montagnes de l'Asie Mineure et de l'Arménie" (82), and the vegetation is dealt with in his booklet "Kleinasien" (83, p. 55—86). — Sintenis made a big collection (in 1892) in Northern Anatolia, chosing as his base the town of Tossia in the Ilgaz chain, Küre (according to him — Küre-Nahas), and Edjevid in the coast mountain chains — all three localities also visited by us, with the only difference, that our base in Ilgaz-Dagh was situated in another valley — through which runs the road from Ankara to Ineboli — namely Ilgaz-Su. Another time Sintenis collected in the eastern part of northern Anatolia: near Trebizond and in northern Armenia (Zigana-Dagh, Sumila, Gümüschkhane). Trebizond has always been rather easily accessible from Constantinople, and being at the same time very attractive, on account of the extremely rich vegetation of its environs, has served as a starting point for many botanists (Koch, Balansa, Bourgeau, Handel-Mazzetti etc.).

For every student of Northern Anatolia the collections of Bornmüller are of great importance. The results of his travel in the chain of Ilgaz-Dagh (in 1929) are — to my knowledge — not yet published[2]), but his numerous publications concerning oriental plants and his collections from the Pontus region, the vicinities of Ankara, and so on, constitute a solid basis for every one interested in the flora of Asia Minor. Thanks to him the determinations of Sintenis's plants made by Haussknecht have been rectified (10). Other parts of Sintenis's collections have been worked over by Stapf (Kew) and Freyn (Brno). Of smaller importance are the collections of those travellers who have crossed Northern Anatolia but have gone farther on to the East, therefore we do not mention them.

Save two short notes by Markgraf (45, 46), based on data collected during the excursions in 1926/27 to Asia Minor of the geologist Nowack, there is no description of the vegetation of the central part of Northern

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[1]) Partly in text, but mostly in the footnotes. Especially valuable are his observations on the vegetation of Antitaurus (vol. I — page: 680, 685, 690), because — to my knowledge — no botanist has ever visited these savage chains.

[2]) Prof. Bornmüller's important publication "Symbolae ad Floram Anatolicam" (13), which began to appear quite recently, deals with his own collections (made in 1889, 1890 and 1929) and with those of Sintenis and Bernhard (1928 to 1930). It so far embraces the families: *Ranunculaceae* — *Caryophyllaceae*.

Anatolia. For its eastern part we have a very valuable paper by Handel-Mazzetti, for the western — short papers and some notes scattered in geological papers on the vegetation of Mt. Olympus, the vicinities of lake Sabanja, Hendek, and so on — by Theel (84), Risch (62), Berg (8), Nowack (52—54). — I therefore decided to make full use of my observations; although I am quite aware that, being made during but two short trips in one year only, they are, perhaps, not of great scientific value, and some of my conclusions based on them may prove erroneous in the future. During our stay in Ankara we made our first acquaintance with the steppe communities (particularly on the rocky substratum) which are so very characteristic of the interior highlands of Anatolia. Owing to the late season of the year (1. VII. —9. VII.) this vegetation was already in a very destroyed state, the vegetational period of most species being over. Afterwards our knowledge of steppe-communities became closer during our travels to Changri and thence to Arab and Tukht. The altitude of both the latter localities surpasses 1000 metres, hence the steppes there still preserved many of their species in a flowering state.

In the vicinities of Changri we admired with great interest semi-desert spaces of Miocene gypsaceous marls, in places marvellously coloured in all shades of yellow and red, and here and there covered with quite a specific gypsophilous vegetation.

At Arab — situated at about 25 km to the south-south-west from Changri, on the slope of the island-like mountain massif of Eldiven-Dagh, we had an opportunity of more thoroughly studying not only the steppes, but also, for the first time, the pine-woods and shrubby communities consisting of oaks, both of them peculiar to all mountain chains and cones of Central Anatolia that rise a few hundred metres above the level of the plateau (700—800 m). — The oak shrubberies consist either of one species of oak or — more often — of several species, and in their specific composition differ in the different parts of Anatolia.

In the vicinities of the small town of Tukht (some 30 km to the north-north-east of Changri — see route-line on Map 2), apart from the well-preserved steppe communities, we could observe the most interesting transition from steppes to woodlands of Northern Anatolia. The forests were here represented by *Abies* woods; isolated trees of *Pinus nigra* var. *Pallasiana* and *P. armena* were also met with. In addition to these, oak-shrubbery was again present, and — on account of the considerable altitude (about 1500—1900 metres) — the subalpine vegetation could be studied too.

Farther on to the north, in the imposing chain of Ilgaz-Dagh, we encountered dense coniferous forests, which form the southern limit of the North-Anatolian region of mixed and foliaceous forests. Here we made two ascents to the highest summits (Büyük Ilgaz-Dagh and Kush-Kayasy, both above 2000 m), which enabled us to study for the first time the alpine vegetation.

Farther on, the route to the Black Sea — to Ineboli, leads through the plains, through which the river Geuk-Irmak flows. Here again we found steppe communities, although restricted to the uncultivated strips between fields, edges of roads, and to the rocky grounds — all other places being used up for cultivation. Along Geuk-Irmak are situated all the more important towns of this part of Anatolia: Kastamuni, Taschköprü and Boyabad. — We crossed the width of this plain on our way to Ineboli, and the length — when going to the mountains Alfar Dagh (?), as it seems not visited by any botanist until now. In the latter mountains we found most beautiful forest of *Pinus nigra* var. *Pallasiana* and copses and shrubberies consisting of many species of *Quercus*. — On our way to Ineboli, we were obliged to cross once more the mountain chains, lying already in the coastal zone of "South-Euxine" vegetation. In the forests near Edjevid, Küre, and farther on to the north, in the undergrowth *Rhododendron ponticum* is already to be found; *Vaccinium Arctostaphylos* and *Rhododendron flavum* grow abundantly among the oak shrubbery and pseudomacchia. — Near Ineboli, Mediterranean macchia, which we had not seen since leaving Constantinople, greeted us again.

From this short revue, we can see of what great importance is the tract of Northern Asia Minor situated between Ankara and Ineboli: it gives a cross section of all vegetational zones which characterize Northern Anatolia. But the vertical distribution of the vegetation can also be very well studied. The rough transition from the steppes of the Interior to the forest zone, at first coniferous, afterwards mixed and foliaceous, with evergreen undergrowth, strikes every traveller, therefore it is even mentioned by non-botanists in their travel notes.

**Ankara** (Angora). Let us pass now to the more detailed description of the vegetation of each locality visited by us:

Ankara — the present capital of Turkey — is situated in northern part of the highland of the interior of Asia Minor. Above the lower part of the town, inhabited chiefly by Turks, being at about 850 m, there is an upper — Greek quarter, enclosed by an old wall, which

surrounds also the old ruins — highly picturesque — of the citadel (Pl. IX, Phot. 17, 18). Trachytic rocks, of which this hill is formed, and others surrounding upheavals, bear, within the town, a dense overgrowth of *Peganum Harmala*, outside the town they are exclusively covered by steppe vegetation; not a single tree is to be seen, even shrubs are absent. In the town itself here and there a dusty acacia tree grows. The climatic conditions of the locality are not known exactly on account of the lack of meteorological records for many years[1]).

Of the older plant collectors, who have botanized on this spot, we should name Wiedemann and Tchihatcheff, of the more recent ones: Bornmüller, Andrasovszky (whose paper [4] is written — unfortunately — in the incomprehensible Hungarian language), who spent only one day in Ankara; a former British ambasador — Lindsay — collected near Chankaya (4 miles to the south from Ankara) about 87 species. In the note by Horwood and Turrill (33), who worked over his collection, we find some observations on the climatic conditions of the country. — After a severe winter comes a dry April and rainy May. From June to September a long period of drought lasts and all vegetation perishes. The most pleasant season is the autumn with its sunny days and frosty nights.

Not one of the collectors gives us the precise date when the period of vegetation begins. Lindsay collected his plants from 15th April to 7th June.

Although we passed 8 days in Ankara, the preparations for a longer excursion did not permit us to spend much time in collecting. Besides this the late time of the year had destroyed already nearly everything, and even the higher hills, situated to the east of the town, did not look very inviting. — During our 3 excursions to these trachytic hills, rising about 400 metres above the town (therefore having an altitude of about 1200 m), we noticed two different types of vegetation: 1. that peculiar to the rocks: *Teucrium polium* var. *lanuginosum*, *Galium aureum*, *Paronychia kurdica*, *Herniaria incana*; on bare rocks in fissures we observed large tufts of the elegant grass *Pennisetum orientale* and tufts

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[1]) To my knowledge, there exist only 8 years records for Ankara, they are worked over by Fitzner (21). They concern the precipitation, cloudiness and the direction of winds on the days with precipitation. Unfortunately the temperature conditions are not mentioned. — The yearly amount of precipitation for Ankara is given as being 235 mm (l. c. p. 46). The driest months are July and August, with their 2 and 1 day's rain, the wettest month being May, with its 10,6 rainy days.

with innumerable white-yellowish flowers of *Dianthus crinitus*, 2. that peculiar to the spaces, where on the rocky subsoil a layer of soil has already formed. Here the vegetation is more abundant, though it never has the appearance of a closed carpet. Nearly all plants are either grasses or small shrubs with ligneous stalks. We noticed here:

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|---|---|---|
| 2—3.2 | *Xeranthemum squarrosum* var. *unicolor* | *Euphorbia tinctoria* |
| 2—3.2 | *Elymus caput Medusae* | *Phlomis armeniaca* |
| 2.2 | **Bromus anatolicus* | **Alkanna orientalis* |
| 2.2 | **Echinops Tournefortii* | **Astragalus piletocladus* |
| 2.1 | **Centaurea Myconia* | *Centaurea squarrosa* |
| 2.1 | *Paronychia kurdica* | **Heliotropium suaveolens* |
| 2.1 | **Stipa barbata* | **Anchusa ochroleuca* var. *canescens* |
| 1.1 | *Kochia* sp. | *Senecio vernalis* |
| r.2 | *Digitalis orientalis* | *Achillea micrantha* |
| | *Aegilops truncialis* | **Alyssum minutiflorum* |
| | *Stipa Lagascae* | **Nigella arvensis* var. *glauca* |

*Digitalis*, *Xeranthemum*, *Echinops* and *Centaurea* were still in full blossom. Numerous beetles were busy on the flowers and yellow scorpions were hidden under nearly every stone. Notwithstanding the drought, a small kind of turtle was met with. It lazily moved about in the dried bed of a stream occupied by *Lysimachia atropurpurea* in numerous individuals[1]).

[1]) It is interesting to note that, adding to the 36 species collected near Ankara by Wiedemann (1835, season of the year unknown) the 58 collected by Andrasovszky (1911, April), the 87 — by Lindsay (1926 April—June) and the 27 by myself (1925, July), and not repeating those which are in common with the oldest collection — that of Wiedemann — we shall obtain the total number of 193 species. Taking into consideration that the place receives but 235 mm of rain a year and that the dominant soil is bare volcanic rock, the richness of the flora in the environs of Ankara must seem surprising. We must also remember that there are at least 193 species. If we could add the plants collected by Tchihatcheff and Bornmüller, this number would surely be still greater.

A comparison of the composition of the four given collections leads to another interesting conclusion: Wiedemann's and Lindsay's collections have 8 species in common; the former as compared with Andrasovszky's and my own have no species in common, lastly Lindsay and Andrasovszky collected 5 identical species, mine has but 2 species in common with each of them, of these — *Alkanna orientalis* has been collected by all three collectors (but not by Wiedemann). As there is no great variety of habitat in the vicinities of Ankara, I am obliged to admit that during the short vegetational period from April (or

**From Ankara to Changri.** On June 10th we started in two automobiles to Changri. The way led first through the valley of Chibuk-Su. Along the rivulet the willows, poplar-trees, elms and walnut trees formed dense but dusty thickets; near the road — some *Rubus* spp. were seen. Vineyards were visible here and there on the semi-desert porphyritic rocky slopes. Near the village of Ravly, on a chalky escarpment (according to Lebling [41] of Devonian age), I saw a lot of bright yellow *Achillea micrantha*, and in the village itself near the water — old willow-trees and flowering *Elaeagnus hortensis*.

As we ascended to the river divide between Chibuk-Su (system of Sakaria) and Amadil-Chai (system of Kizil-Irmak), the steppe vegetation grew fresher and more rich in blossoming plants. Near the river divide splendid *Morina persica* appeared. This plant impresses everyone who sees it for the first time as a plant really deserving garden cultivation. Its inflorescences, the flowers of which change their colour as they develop from white to pink and violet, produce a really charming impression. At the altitude of 1325 m, on the river divide, a small halt was made and this gave me the opportunity of studying a very pretty patch of steppe vegetation. Silky Ankara goats were seen grazing, which, together with a very variegated carpet of steppe vegetation and bluish mountainous country seen in the distance, created a typical picturesque scene of the interior of Anatolia.

On the crystalline limestone (Devonian, Lebling l. c.) the following species were found growing together:

| | |
|---|---|
| *Stipa* sp. | *Achillea micrantha* |
| *Gramineae* spp. | *Echinops* sp. |
| *Allium pulchellum* | *Galium verum* |
| *Allium rotundum* | *Malabaila Sekakul* |
| *Phlomis armeniaca* | *Astragalus* sp. |
| *Salvia Sclarea* | *Linum* sp. |

earlier?) to July the composition of the Ankaran flora is subject to great variation and the species follow one another in quick succession.

To the above notes, written several years ago, it may be added now that Krause's "Zur Flora von Ankara" (1934) does not include nearly half the species (marked with an asterisk) of the above list. This deficiency seems to be due, in part, to Dr. Krause not taking into account Andrasovszky's collection. On the other hand, many critical notes have appeared since the time of Boissier, which I was glad to use when arranging systematically the Turkish plants. Moreover, in the more difficult cases (*Centaurea*, *Astragalus*) I have had the benefit of the specialists' aid.

*Salvia cyanescens?*
*Acanthus hirsutus*
*Centaurea squarrosa*
*Chardinia xeranthemoides*
*Arenaria Ledebouriana* var. *glutinosa*
*Umbelliferae* spp.

From the river divide we descended to the rather wide valley, in which the rivulet Amadil-Chai has its upper course. It represented a typical "ova" (valley of partly tectonic partly erosional origine, see Penck 58), occupied by cultivated fields of maize and wheat. Here and there solitary trees of silvery *Pirus elaeagrifolia* could be noticed. More of them, nearly a grove, were seen farther on — in the middle part of the valley (Pl. X, Phot. 19). From the south the valley was closed by the bare slopes of the peneplainized massif constituting the continuation to the east of Idris-Dagh, which Lebling[1]) supposes to be of Paleozoic (Devonian?) age. — At the northern end of Amadil-Chai ova, through a narrow ravine, where the rivulet rushed in rapids among the thickets of shrubs and trees looking here like an oasis, we reached again the hilly steppic plains, monotonous in colour and outline, on which Kalejik is situated. Passing by this town we followed rapidly our way to the north-north-east. Occasionally some birds and hideous hairy phalangas fled in terror from our madly driven auto. A hare crossed our way. Save these — there was nothing interesting either to botanist or to zoologist. The country, being situated on an average at about 700—800 m, was — like the vicinities of Ankara — in its period of summer peace, caused by the heat and the lack of rain. Not far from Tunei, when passing near a tributary of Adjy-Su, flowing with its muddy waters among the semidesert banks, we stopped near a bungalow and picked, as it has been proved afterwards, a new species — *Althaea rugosostellulata*, pretty *Genista Jauberti* and rosy-flowered pricky *Alhagi camelorum*. In the twilight we entered the most interesting district of the Neogene gypsaceous marls, with its steep ravines and table-hills. The slopes, although bare, were not at all monotonous, being distinctly stratified and very bright in colours. In total darkness Changri was reached. The last part of the way followed the course of Adjy-Su; although we could not see it already, the coolness and freshness of the air, rustling of trees, and bubbling of water told us about the nearness of woody river banks.

**From Changri to Tukht.** On the next day, without visiting the immediate neighbourhood of Changri, we started in the afternoon, in

[1]) He speaks (41) about "die große Rumpffläche Anatoliens, die hier in Idris-Dagh zutage tritt".

two very uncomfortable Turkish carts, in the direction of Tukht. This small town, situated at about 7 hours pack-horse ride to the N—NE from Changri, can be reached by two ways — both in a very primitive state: both lead through the bright Miocene gypsaceous tracts, with the only difference, that one is situated in the lower part of the hills facing the valley of Karakaya-Chai[1]), the other, higher up — on the same hilly highlands. We chose the former as our way there, and returned by the latter. Along the river, down the hills, were seen dense thickets of poplars and shrubs, reminding us of "gallery-forests" — as seen on the pictures of African steppe districts. But the spaces which we crossed were mostly quite bare, or — in rare places overgrown by the dainty *Gypsophila*, or — in flat hollows covered with whitish patches of salts — by strongly odorous *Artemisia*. Higher up — the cultivated fields began, but they were mostly very poor. We noticed among the wheat two very bright weeds: *Saponaria prostrata* and *Onobrychis hypargyrea* var. *spinuligera*. Still higher up we passed more fertile grounds, where even the cultures of vine were prospering at 1250 m altitude (near Bunar-Keui) and for the first time the most typical and peculiar plant of Asia Minor was met with, namely the very pricky but splendidly flowering *Acantholimon* (*A. acerosum*). Near Tukht we collected two species of larkspur growing in the wheat: *Delphinium orientale* with gorgeous dark violet blossoms, and tiny and paler *Delphinium Barcyi*.

**Tukht and Panair mts.** The small town of Tukht, being situated far from any high road, had probably seen few Europeans. At least we were led to this conclusion by the crowd that gathered around us, while we were served with tea in the open-air "café", being obliged to wait for some baggage animals, which could carry all our equipment up the the nearest mountains, where we planned to camp. — I especially, being a woman and with my face uncovered, was the object of joke and of rather an unkind and even fiendish attitude on the part of the crowd, consisting exclusively of men. But the figures of black veiled women, who could not check their curiosity either, occasionally peeped out from the narrow streets, yards, or from behind the latticed windows. — After a painfully long wait, several mules were procured and we started, clearing with difficulty the way amidst an excited crowd. — The 3—4 km which remained led up a very steep slope of the Panair mts. (as a whole they have no name, I call them so after the highest summit Panair-Tepe),

[1]) After the confluence with the Tatly-Su, below Changri, it bears the name of Adjy-Su.

at the foot of which Tukht is situated. We followed the loaded animals on foot, glad to stretch our cramped limbs after our long ride of several hours.

The spot which was unanimously chosen for pitching our tents, bears the romantic name of Chirchir-Bunar (Bubbling Brook) and lay in a lower part of the crest, across which the path led to the villages situated in the mountainous country, extending northward as far as to Devrez-Chai and eastward — to Kara-Kaya and Kush-Dagh. — We spent three days there, not counting the day of arrival and that of departure, and it was with a feeling of regret that we left them, knowing that they deserved a much longer stay. Being situated at about 1542 m — nearly 500 metres above Tukht — it was one of our highest encampments and certainly the one with the finest view. To the south-west, the steep slope down which the path led to Tukht, was cut by two deep ravines, behind — to the north-east — another deep ravine separated our encampment from the bare summit of Bokly Tepe, which barred the view to the north. To the right and to the left the same crest on which we were standing, continued with varied altitude. — The place was of great botanical interest, because we could study the transition from the steppes of Central Anatolia to the forest zone of Northern Anatolia. The highly varied surface, cut by deep ravines (either dry or occupied by the streams flowing to the Karakaya-Chai), bears in places rocky steppe vegetation, on deeper soil — grass steppes, on the northerly and westerly slopes—shrub-communities, on the slopes of the ravines—solitary trees of two kinds of pines, on the higher summits — the first forests of *Abies*. Further variety was added by the formation of an artificial "meadow" on the spot where the cattle market is held from time to time[1]). Let us describe these communities one by one:

The southern slopes of the Panair mts. over which the path from Tukht runs up the mountains, consist of sedimentary rocks[2]): of sandy limestones with transition to slates, pure limestones and sandstones. These rocks are very rich in fossils, which testify to their Cretaceous age[3]). In the calcareous sandstones, containing much calcite, as a result of their heterogeneity, numerous fissures originated and an underground cave is also present.

[1]) Hence the name — Panair, which word originates from Greek and means "annual fair".

[2]) All the geological data, if not followed by any quotation, have been taken from the unpublished accounts of Prof. W. Nikitin (by his kind permission).

[3]) The fossils, collected carefully by a member of our expedition — the late Joseph Zawadzki — are at present being by arranged specialists.

In the direction to the north-west the sedimentary rocks pass to a massif of igneous rocks, which constitute all the highest summits. They have porphyritic structure and are allied to gabbro. In the ravines could be met among sedimentary rocks — the batholites of trachytic rocks. Notwithstanding this great variety of substratum I could not determine any dependence of vegetation on it. The latter seemed to be determined by the thickness of the soil layer, the steepness of the slopes, their exposure and the altitude above the level of the sea.

The climatic conditions of the place are quite unknown. The measurements of temperature during five days resulted in the following data[1]):

| Locality and altitude | Time of day | morning | | afternoon | | evening | |
|---|---|---|---|---|---|---|---|
| | Date | hour | temperature C | h | t | h | t |
| Tukht (Chirchir-Bunar) ca. 1542 m | 11. VII | — | — | — | — | *24* | 16.2° |
| | 12. VII | *8.15* | 16° | *18* | 24° | *21* | 19.8° |
| | 13. VII | *7.30* | 20.5° | — | — | *21* | 18.9° |
| | 14. VII | *8* | 19° | — | — | *21* | 19° |
| | 15. VII | *7* | 19.5° | — | — | *21* | 24° |
| Changri ca. 795 m | 16. VII | *7.45* | 19.3° | — | — | — | — |
| | 19. VII | — | — | — | — | *23.30* | 24° |
| | 20. VII | *7* | 28.2° | — | — | — | — |

During the day the measurements were omitted on account of constant excursions. — For the sake of comparison are given few sporadic observations made in Changri. The cooling effect of the higher altitude in Tukht is obvious.

The steep slopes with southern exposure, independently of their constitution (of sedimentary rocks or plutonic ones) are covered, from the altitude of Tukht (1050 m) to where our encampment was situated (at about 1542 m), and even higher up, by rocky steppe vegetation.

[1]) The measurements were carried out with one of the thermometers of the psychrometer of Assman; most unfortunately it arrived at Ankara with another thermometers brocken, thus our intention to get the data for calculating the humidity and the deficiency of humidity of the air was frustrated.

On account of its extreme steepness and numerous fissures and ravines and also its stoniness, it remains uncultivated and serves as pasture ground for the cattle, goats and sheep. Thanks to them, the steppe vegetation was already in a much "eaten" state. The full picture as to how this steppe could look was given us by a small scrap of ground limited on all sides by rather deep fissures, therefore left undestroyed. Before describing it, we shall give a brief account of those species which we noticed as constituting the steppe vegetation at the height of 1500 to 1600 m near our encampment. — On the steep places where bare rocks come to the surface, in fissures we noticed the pretty *Centranthus longiflorus*, *Melica ciliata* var. *micrantha*, *Hypericum origanifolium* (found but once), the delicate *Teucrium orientale*, on very rocky substratum, magnificent *Sedum Sempervivum* by its blood-coloured flowers caught at once my attention. *Morina persica* was in full bloom. In the narrow ravines of this slope we found in places dense shrubbery of *Hippophaë rhamnoides*, by the water — occasionally *Caucalis daucoides*, *Euphorbia Szoritsii* and *Rumex scutatus* var. *hastifolius*. Save these plants, the slopes were quite devoid of any vegetation. On the crest, where the steepness was much less, on more deep soil the steppe vegetation was much richer, and in measure we turned to northerly and westerly exposure more and more shrubs appeared, till they constituted a whole region, covering at the height of about 1500—1600 m the whole slope, however being scanty or absent on those with southern and south-eastern exposure. The first solitary pioneer shrubs seem to appear at the altitude of 1100 m. At the altitude of 1500—1600 (1650?) — where the region of shrubs is the most typical — it is constituted by shrubs of 1—1$^1/_2$ metres in height, standing at a distance of 2—10 metres from each other. The following species were represented:

2—3.2 { *Quercus* sp.
*Quercus pseudotozza*

2.1 *Cotoneaster nummularia*

2.1 *Juniperus Oxycedrus* (often with *Arceuthobium oxycedri*).

1—2.1 *Berberis crataegina* (having but $^3/_4$ metres in height).

2.1 *Crataegus tanacetifolia* (locally abundant).

1.1 *Rosa* sp.[1])

Under each shrub or group of shrubs there is to be found specific vegetation, reminding one of forest vegetation more than that of steppe. We have found under them:

[1]) It is curious to note that the species of *Rubus* were not met with higher than the immediate vicinities of Tukht, that it to say at about 1000 m altitude.

1.1 *Lathyrus (Orobus) tukhtensis*
1.1 *Astragalus anthylloides* var. *villiger?*
1.1 *Centaurea axillaris* var. *cana*
r. 2 *Iris Kerneriana*

The steppe vegetation of the southern slope devoid of shrubs (near the crest) and of spaces between the shrubs seemed to us identical (the degree of abundance was for some species different on the northern slope!), therefore we shall give here the one list for the two, still more so, as they constitute an immediate transition one to another, on the same crest. The upper layer and the lower one were rather indistinctly recognized, on account of grazed surface; we noticed:

| | | | |
|---|---|---|---|
| 2—3.2 | *Senecio vernalis* | 1.1 | *Inula Montbretiana* |
| 2—3.2 | *Globularia trichosantha*[1]) | 1.1 | *Onosma Briquetii* |
| 2—3.2 | *Acantholimon Echinus* | 1.1 | *Asperula graveolens?* |
| 2.1—2 | *Helianthemum* sp. | 1.1 | *Achillea* sp.? |
| 2.2 | *Phlomis armeniaca* | 1.1 | **Scutellaria orientalis* |
| 2.2 | **Teucrium Chamaedrys* | 1.1 | *Astragalus* sp. (sect. *Onobrychium?*) |
| 2.1 | *Morina persica* | 1.1 | *Euphorbia* sp. |
| 2.1 | *Galium* sp. | 1.1 | *Umbelliferae* |
| 2.1 | *Paronychia anatolica* | 1.1 | *Ononis* sp.? |
| 1—2.2 | *Plantago carinata* | 1.1 | *Teucrium polium* var. *lanuginosum* |
| 1—2.2 | *Linum tenuifolium* | r.2 | *Astragalus* sp. (white pussy leaves) |
| 1—2.1 | *Stipa pontica?*[2]) | r. 1 | *Potentilla* sp. |
| 1—2.1 | *Gramineae* (yellowed and eaten) | r. 1 | *Bromus tomentellus?* |
| 1—2.1 | *Digitalis orientalis* | r. q | **Melica ciliata* var. *micrantha* |
| 1.1 | *Galium aureum?* | r. 1 | *Sedum Sempervivum* |
| 1.1 | *Onobrychis* sp.? | r. 1 | *Carex* sp. |
| | | r. 1 | *Mattiastrum paphlagonicum* |

The following species were collected in the same locality, the frequency degree not being recorded:

[1]) This plant, as well as those marked with an asterisk, seems to be bound to fissures in the rocks (sandstones, trachytes) or to rocky underground.

[2]) On the northern slope *Stipa* is much more abundant.

| | |
|---|---|
| **Teucrium orientale* | *Alyssum tortuosum* |
| *Hypericum origanifolium* | *Arenaria Ledebouriana* var. *glutinosa* |
| *Alkanna orientalis* | *Polygala anatolica* |

The above-described community (of shrubs and steppe vegetation) must be considered as a complex community consisting of two totally different associations, which penetrating each other and occupying the same space look at first like an entity.

When descending a very deep ravine dividing us from the summit of Bokly-Tepe, we noticed the first solitary pines, of medium height (4—5 metres), which afterwards proved to belong to *Pinus nigra* var. *Pallasiana* and *Pinus hamata*. Both were fruiting abundantly. They occupied for the most part inaccessible walls with northern and western exposure. In the more accessible places they were strongly misshapen by cattle and men (Pl. X, Phot. 20, Pl. XI. Phot. 21). — On the bare slope we noticed a new plant, growing in big bunches in the fissures of the rocks — *Hypericum scabrum*[1]); at one place — on a rocky threshold several metres high there was a waterfall. It was not imposing with its scanty quantity of water; only a very limited space, which constantly received water-spray, displayed a much richer vegetation. On the slopes, on both sides of the waterfall, several trees of *Pinus hamata* offered an unusual sight among the bare slopes; *Hedysarum varium* — in abundant tufts — embellished the slopes; close to the falling water gigantic *Alchemilla brachyloba* and *A. mollis* were seen, and beside it there was *Veronica Anagallis* and some *Carices*.

On the much less steep eastern slope of Bokly-Tepe, in its lower part, under the protection of the steep and high opposite slope of the ravine, at an altitude of 1620 m, the shrubs of oaks formed locally an almost closed association. Among these I found the peculiar *Fibigia clypeata* and *Centaurea Czeczottiae*. In such a place the real steppe vegetation was depressed and undeveloped.

Above the region of shrub vegetation we met an undestroyed piece of steppe. On the slope which had here locally a southern exposure, at an altitude of 1620 m, we found:

Upper layer:

*Bromus tomentellus* var.
*Stipa pontica?*
*Gramineae* (*Agrostis?*)

[1]) It is used by the natives as a tea-surrogate.

Lower layer:

*Teucrium polium* var. *lanuginosum*
*Teucrium Chamaedrys*
*Zizyphora clinopodioides*
*Astragalus* sp.
*Sideritis montana* var. *comosa*

Only a half of the surface was covered with this vegetation. Loosely hanging panicles of *Bromus* and of *Stipa* waved in the breeze. Rich dwarf shrubs of *Teucrium* and *Zizyphora* filled the air with an intoxicating odour of their oils.

When climbing higher up, the view to the south became more and more extensive. In the bluish distance the Miocene plains, with their ravines and table hills, filled the space to the horizon. A never to be forgotten view! (Pl. XI, Phot. 21). We could enjoy it still more, as on the rocky south-eastern slope, up to the summit (to 1820 m), there were but few plants for collecting growing among bare rocks and stones of plutonic origin. They were: *Acantholimon lycaonicum*, *Paronychia anatolica*, *Alyssum minutiflorum*. The highest plant to be met with was *Globularia trichosantha*. Near the very summit we found a solitary small tree of hybrid nature: *Crataegus tanacetifolia* × *Azarolus*, just in full blossom, with many curious green beetles on it[1]).

When standing on the summit it was curious to note what an immense change in ecological conditions the exposure causes: the southern slope — nearly vertical — was bare and had but solitary plants in fissures. The disintegration caused by physical factors only (cracking under the influence of insolation, the taking away of small particles by the wind) does not lead to the formation of soil, the northern slope — very easy — was covered with a juicy cover of grass, looking (comparatively) fresh and green. One could at once notice that under the cover of vegetation a rather thick layer of soil is hidden. All this probably on account of weaker insolation and the influence of northern winds, which bear humidity.

This northern slope, a 100 metres lower (at about 1700 m) passed to a flat surface, encircled by a low stony wall. This spot gave the name to the two highest summits of these mountains; it served as a market place for cattle, in Turkish — Panair, hence — Panair-Tepe, the name of the highest summit, to which we shall make an excursion, and Bokly-

[1]) A small collection of beetles and butterflies was also made during our wanderings in Anatolia.

Tepe, which means literally—dungy summit. Probably the market had taken place a long time before, because the surface of the "market-place" displayed one of the most flowery and coloured association met by us in Turkey. After the dominant plant we shall name it *Verbascetum speciosae*. Its composition was:

***Verbascetum speciosi*** on the northern slope of Bokly-Tepe, altitude 1700 m. (14. VII.)

---

I upper layer (1—1½ metre in height):

| | |
|---|---|
| 2.2—3 | *Verbascum speciosum* |
| 2.2 | *Onopordon* sp. |

II layer (about 30 cm in height):

| | |
|---|---|
| 3—4.3 | *Marrubium astracanicum* |
| 3.2 | *Poa pratensis* var. *angustifolia* |
| 2.2 | *Phleum* sp. |
| 2.1 | *Verbascum speciosum* — rosettes. |
| 1.1—3 | *Onopordon* sp. — rosettes. |
| 2.1 | *Bunium* sp.? |
| r.1 | *Papaver* sp. |
| r.1 | *Anchusa* sp. |

III layer (2—5 cm in height). closed turf of:

| | |
|---|---|
| 3.3 | *Sagina* sp.? |
| 3.3 | *Trifolium* sp. (white-flowered) |
| 1.1 | *Trifolium* sp. (with red flowers) |
| 2.2 | *Plantago lanceolata*? |
| 2.1 | *Achillea* sp. |
| r.1 | *Labiatae*. |

We moved farther on along the same crest, in the direction to north-north-west. After passing two cultivated fields, we entered the forest of *Abies Nordmanniana* var *leioclada*, much destroyed at the outskirt, but which soon became quite closed and dense. It covered the north-western slope of highest summit (in the vicinity) — of Panair-Tepe, which had about 1950 m in height. The general trend of the crest was north-north-east to south-south-west. From the summit we could admire on the one hand the far distant interior plains, on the other, seen already from Bokly-Tepe, the distant imposing chain of Ilgaz-Dagh. We got the impression that we were standing on the verge of highland plains, cut off steeply from the south, but passing gradually to the woodland hilly plains to

the north. One could notice that the land to the north — although with predominance of forest — bears also wide steppe tracts: on all slopes facing south and south-east (Pl. XI, Phot. 22).

On the summit itself was a strange mixture of steppe-, meadow-, forest- and subalpine plants. We found there: *Cotoneaster nummularia*, *Epilobium angustifolium*, *Astragalus baibutensis* var. *macropetalus* (splendid 1/2 metre high shrub!), *Pyrethrum poteriifolium* f. *multicaulis*, *Euphorbia Myrsinites*, *Teucrium polium*. When entering forest, small in height but very dense and shady, we found quite another vegetation:

***Abietetum Nordmannianae*** on the Panair-Tepe, altitude. ca. 1900 m, exposure NW. (14. VII.).

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Tree stratum (4—6 metres in height):

4—5.4 *Abies Nordmanniana* var. *leioclada* — the trees had 10—15 cm in diameter, occasionally the circumference reached 1 metre. The distance between the trees 1—3 metres. Closeness of crowns about 9. Abundantly fruiting. Seedlings and saplings abundant.

1.1 *Pinus armena*

Shrub stratum (about 50 cm in height):

1.1 *Juniperus nana*

Ground stratum (3—30 cm in height):

| | | | |
|---|---|---|---|
| 3.2—3 | *Pyrethrum poteriifolium* | 1.2 | *Campanula olympica* |
| 1—2.2—4 | *Trifolium armenium* | 1.1 | *Trifolium* sp. |
| 1—2.2—3 | *Sesleria argentea* | 1.1 | *Lathyrus sericeus* |
| 1—2.2 | *Thymus Serpyllum* | 1.1 | *Silene italica* |
| 1—2.2 | { *Hieracium cymosum* ssp. *paphlagonicum* | 1.1 | *Coronilla* sp. |
| | *Hieracium* sp. } | r.3 | *Pirola* sp. |
| | | r.1 | *Bromus asper* |
| 1—2.1 | *Poa nemoralis* | r.1 | *Silene inflata* |
| 1.3 | *Galium spurium* var. *tenerum* | | *Asperula involucrata*? |
| | | | *Polygala anatolica* |
| 1.3 | *Stellaria Holostea* | | *Lapsana* sp.? |

Bottom stratum:

*Brachythecium* sp. — very sparse.

All these plants are distinctly bound to more open spaces: in places where the sociability of trees is 4 — there is a naked surface, devoid even of mosses and covered only with fallen needles.

Returning by another way — on the crest which constituted the direct continuation of the one on which our encampment stood, we stopped on a lower summit, 1800 m, devoid of forest, but bearing very typical vegetation of subalpine type, peculiar to heights above 1700 metres situated on the limit between steppes and woodland (see below — on the ascent of Kush-Kayasy in the Ilgaz-Dagh). — The surface was densely covered with shrubs of *Juniperus nana*, from below peeped graceful white capitula of *Trifolium armenium* and the spendidly soft tall weed *Stachys lanata* was for the first time met with: the latter — as it seems — is quite a typical representative of the subalpine flora in the zone of transition (cp. Markgraf, 45, p. 370; 56, p. 755). On a few open spaces we saw pretty reddish buds and open yellow flowers of subalpine-alpine *Hypericum polygonifolium* var. *paphlagonicum*.

Let us summarize the general impressions from the zonation and vertical distribution of plant-communities near Tukht.

The three summits described by us: Bokly-Tepe (1820 m), summit of no-name (overgrown with *Juniperus nana*, 1807 m) and Panair-Tepe (1950 m) — are situated on a line in the direction NNW—SSE; the nearest to the steppes and quite open to the influence of drought of the Central Anatolia is Bokly-Tepe, hence its bareness (probably cattle are responsible for this also), on the next summit — lying farther to the north — the subalpine vegetation of *Juniperus nana* shrubs is developed. Under the cover of this summit remains the outskirt of the forest — at present destroyed — but with solitary trees of *Abies* and *Pinus*. The forest reaches its full development on the third summit — the farthest to the north — Panair-Tepe (the distances between the summits are not more than 2—4 km). The slopes looking south — of all three — are devoid of either forest- or shrub-vegetation. Exceptionally in ravines, which afford protection from dry winds, and give more coolness and shade, solitary trees (*Pinus*) and rather dense shrub communities can exist. As to the vertical distribution: we could not notice exactly on the southern slopes the transition from highland steppes to subalpine vegetation; on northern and western — the limit is more easy to draw, because of the existence of a region of shrubs which reaches its full development from 1550 to 1600 m (but the occasional shrubs begin at 1100 and end at 1650 m). It is curious to note that both juniper shrubs are divided only by quite an insignificant vertical distance from each other: *Juniperus Oxycedrus* constitutes a very important component of the shrub region at about 1550 m, *Juniperus nana* is to be found in full development at 1800 m.

**From Tukht to Changri.** When returning we noticed on the hills near Tukht solitary trees of *Crataegus*, which grow among fields, as in our countries *Pirus communis* does. They probably belong to *Crataegus tanacetifolia* × *orientalis*. In the dry bed of a river a solitary oak of tremendous dimension was passed (it was 8 metres in circumference and proved to belong to *Quercus pedunculiflora* C. Koch). Our way back to Changri led now through barren hills of marl. At the height of 985 m a small halt was made, by which I profited to describe the rather pretty patch of steppe. The surface was covered half and half with vegetation. Notwithstanding the comparatively low position (equal to that of Ankara) — many plants were still in blossom, which fact clearly shows what a great significance the latitudinal position also has. (The place was about 120 km distant from Ankara). The composition of this community was:

3.2 *Astragalus mossulensis*
2.2 *Andropogon Ischaemum*
2.2 *Teucrium Chamaedrys*
2.3 *Senecio vernalis*
2.1 *Echinops* sp.
2.1 *Artemisia maritima*
1—2.1 *Phlomis armeniaca*
1—2.2 *Galium erectum?*
1—2.1 *Allium pulchellum*
1.1 *Althaea* sp.
1.1 *Linum hirsutum* var. *stenophyllum*
1.1 *Allium rotundum*
1.1 *Delphinium Ravey*
1.1 *Onosma* sp.?
1.1 *Centaurea patula*
1.1 *Papaver* sp.
1.1 *Umbelliferae*
1.1 *Gramineae*
r.1 *Asperula refracta*
r.1 *Jurinea anatolica*
r.1 *Hedysarum varium*

On the verge of a near by flat ravine were found dwarfed oak shrubs, intermixed with *Paliurus aculeatus*, among them — abundantly — *Cynanchum acutum* (?). and on the bottom magnificent tall solitary specimen of *Astragalus megalaemus*.

The soil was probably not salted, because near by the only spring which spouted out was of drinking water. — Soon we entered gypsaceous marl districts and among very bare spaces passed a spot densely covered with high bushes of *Gypsophila*. Attracted by its unusual abundance and height (about 1 metre) I stopped the whole caravan (this time consisting of two carts) and collected the whole bunch of it. It proved afterward to be my prettiest new species *Gypsophila Henrici* (Pl. XXIX); it was accompanied by *Poa bulbosa* and *Andropogon Ischaemum*. *Gypsophila* surpassed both in height and abundance. Numerous black

beetles walked amidst them like in a fairy forest. I left with regret this association undescribed; it would probably prove to have quite a specific composition!

The above described steppe-community shows quite a different composition either from the Ankaran steppe or steppes from Chirchir-Bunar. I suppose that this difference is caused, on the one hand by different geographical position (many species in Asia Minor seem to be very localized in their distribution, and the result is great number of newly discovered species in the localities visited for the first time), on the other — by the difference in the altitudinal position: the steppe near Chirchir-Bunar is a typical highland steppe! Below we shall have occasion to compare it with another highland steppes — on the way to Arab — again different, this time probably on account of the difference in substratum (limestones).

After passing but one night in Changri in the "best" hotel, which proved to be full of bugs and chasing them scolopendras, we left with relief this hot town — in the direction to Arab, thus again to Central Anatolia.

**From Changri to Arab.** Our caravan consisted this time of several pack-horses, each horse having its attendant Turk. The small and very poor town of Arab (Pl. XII, Phot. 23) is situated on the eastern slope of the island like massif of Eldiven (Map 2), deeply cut valleys and ravines of which already bear pine woods. The distance from Changri to Arab, covered by pack-horses in 8 hours, is probably about 30 km.

After wading through the flat muddy river of Adjy-Su we soon entered a very narrow and deep ravine, the perpendicular walls of which consisted of coarse conglomerates (of Tertiary age?). In the fissures were seen very tall samples of some yellow-flowering *Umbelliferae* (probably *Ferulago pauciradiata* Boiss. et Heldr., collected by me afterwards on the way to the Ilgaz mts. and growing also in similar conditions). The path led afterwards for about 2 hours through desert-like typical gypsaceous marls, so very rich in gypsum, that its crystals were seen shining on the sun everywhere, and the soil resounded strangely under the hoofs of the horses. The surface was totally devoid of any vegetation. We met but two small trees of *Pirus* and *Crataegus*, the last having the branches quite covered with small rugs. It is a custom in Turkey, for the shrubs and trees which are considered sacred to be covered with small scraps of rugs by the pious passers-by, as a token of their prayers. — In strange contrast with the nude surface, incapable even of cultivation,

stood the vividly green valley of Yanar-Chai (affluent of Adjy-Su), which we were obliged to cross. The rivulet itself was quite hidden in thickets of *Elaeagnus hortensis*, *Pirus*, *Populus* and different shrubs. *Rubia tinctorum* was especially in abundance. — After a short rest we started on again and following the stream soon passed by a narrow gorge with rough rocky walls to another valley, having the appearance of a plain, about which Leonhard wrote: "die Ebene von Seraiköi ist eine der in Kleinasien häufigen Senken, die allseitig scharf begrenzt sind und sich in einer tiefen Schlucht entwässern. Auch dieses Senkungsfeld war früher ein See, bis er gegen Osten seinen Abfluß in Janar-deressi fand" (44, p. 119). — The peasants were peacefully working, ploughing the fields with wooden hook-ploughs — probably known since the time of Noah. — We climbed the very nude and steep slope to reach the heights of Naldoken-Tepe, bearing a spring. The slope to this place was quite devoid of any vegetation, therefore we were still more struck by the beautiful beetles of almond-like shape which were seen in abundance on bare rocks. The village of Yanarkeui (according to Leonhard — Serai-köi), situated at the entrance to a deep valley, where the slopes were covered already with forests, was left aside. The path from now to the proximity of Arab remained nearly at the same level, that is at about 1200—1300 m. To the right opened the vast panoramas with the fertile slopes covered with cultivated fields (wheat) and among which were scattered pear-trees (*Pirus elaeagrifolia*), isolated or standing in groups. The gypsaceous marls were left behind; the sudden change in the substratum took place somewhere near the "punar" (spring), and the rocks passed belonged to silicious slates. Besides these we met in the massif of Eldiven-Dagh with calcites and trachytic tuffs and serpentines.

According to Leonhard (l. c. p. 118) the height of Eldiven-Dagh (its northern summit) ought not to surpass 1620 m[1]) and consists (after Tchihatcheff) of Eocene marls. Lebling, who — as it seems — did not cross the massif itself, but passed by very near, has found near Chandyr even Silurian deposits, and speaks about Eldiven as "einer weiteren alten Platte" (l. c. p. 106). So it is not impossible that we have to deal here with a Paleozoic massif, may be with the presence of Paleogene deposits. Anyhow its very rounded shape and the lack of rough form speaks for its old age.

Probably the whole slightly undulating surface at the height of 1200—1300 m between Naldoken-Tepe and Eldiven was formerly covered

[1]) After the measurement by Prof. Czeczott, who climbed the summit, it is 1650 m in height.

with very rich steppe-vegetation, which was here and there interspersed with small woods of *Pirus* and *Pinus*. We could judge of the richness of the steppe-vegetation by the very bright colours of two uncultivated strips accompanying the path. Never had I seen before, and only once since, such a amount of very tall representatives of *Salvia* (*S. cyanescens*, *S. candidissima*, *S. Sclarea*), flowering with dark violet, blue in all shades and white; delicate new species of *Asyneuma* (*A. eldivenum*) was seen in great abundance. Under the shrubs of *Viburnum Lantana*, *Lonicera etrusca*, *Rosa* and *Crataegus orientalis*, entwined with *Bryonia multiflora*, were seen pretty *Ornithogalum pyrenaicum*. *Dianthus lydus*, *Scabiosa palaestina* and some *Campanula*. As weeds on the fields were seen in abundance *Salvia Sclarea*, *Adonis flammea*. and *Asperula graveolens*. — Near a swampy space, which probably gave birth to the stream at the outlet of which stood the already mentioned village of Yanarkeui, a whole society of irises was seen. They proved afterward to belong to a new species *Iris longepedicellata*.

**Eldiven-Dagh and Arab.** Our camp was fixed at the outlet of a small stream, completely closed in its lower course by wooden sluices for irrigating purposes. Its name was Yaila-Chai and the valley led directly to the summit of Eldiven-Dagh. The place was situated at 1200 m, at $1^1/_2$—2 km from Arab, which distance ensured us the necessary peace for our scientific works.

Nine measurements of temperature taken during three days stay gave us the following numbers:

| Locality and altitude | Time of day | morning | | afternoon | | evening | |
|---|---|---|---|---|---|---|---|
| | Date | hour | temperature C | h | t | h | t |
| Arab ca. 1200 m | 16. VII | — | — | — | — | 22.45 | 18° |
| | 17. VII | — | — | 13.45 | 27° | 21 | 21° |
| | 18. VII | 8 | 18.5° | 15 | 29° | 22 | 26.8° |
| | 19. VII | 7 | 16.5° | — | — | — | — |
| | | Medium: | 17.5° | — | 28° | — | 21.9° |

The place was favourable for the study of rocky steppe communities, xeromorphic oak-shrub vegetation and pine woods characteristic of island like mountain massifs of Central Anatolia.

Beginning with the last, we must state that the trees keep to the slopes facing north, and woods — although thin — are formed only in sheltered positions on the scarps of the valley cutting the slope of Eldiven-Dagh. The summit of this mountain has a rounded shape and the valleys, although narrow, have mostly gentle slopes, save for the uppermost part. Approximately at the middle part of Yaila-Chai there is a side-valley very rich in wild fruiting trees (*Pirus elaeagrifolia, Prunus domestica, Pirus communis*). Soon after passing it, there is a patch of *Pinetum nigrae*, which impressed one strongly after the longer stay in the desert-like or steppe regions of this part of Central Anatolia. How strange sounds the breeze through the trees, how refreshing is the shade and cooling humidity of the forest atmosphere full of the odour of pine needles!

The transition from the rocky steppe vegetation to the forest vegetation is rather rough; in some places it is softened by the presence of shrubby communities.

Bearing in mind that the description of such a kind for Central Anatolia are totally lacking (to my knowledge!) I give below in full the floristic composition of this community.

***Pinetum nigrae*** on the northern slope of Eldiven-Dagh. Altitude 1348 m. Exposure: N and W. (18. VII). A small depression open to the valley of Yaila-Chai. In the lowest part the vegetation consists of *Phragmites communis, Scirpus Holoschaenus* var. *australis, Iris Kerneriana*, and some *Euphorbia*, testifying to the nearness of the level of subterranean water.

---

Tree stratum:

4.3—4 *Pinus nigra* var. *Pallasiana* (well developed trees, about 10 m distant from each other)

Shrub stratum (about 2 m):

| | | | |
|---|---|---|---|
| 2.2 | *Quercus longifolia* (shrub with spread out branches) | 1.1 | *Berberis crataegina* |
| | | r.1 | *Sorbus Aria* |
| | | r.1 | *Viburnum Lantana* |
| 1.1 | *Juniperus Oxycedrus* | r.1 | *Rosa* sp. |

Ground stratum:

| | | | |
|---|---|---|---|
| 2.2—3 | *Briza media* | 1.1 | *Dactylis glomerata?* |
| 2.1 | *Sesleria argentea* | r—1.2 | *Sedum album?* |
| 2.1 | *Onobrychis armena* | 1.2 | *Compositae* |

| | | | |
|---|---|---|---|
| 2.2—1 | *Plantago carinata* | 1.1 | *Helianthemum* sp. |
| 1—2.1 | *Solidago Virga aurea* | 1.1—2 | *Leguminosae* (leaves) |
| 1—2.2 | *Pimpinella Tragium* var. | r. 2 | *Dianthus eldivenus* |
| | *P. Tragium* var. *pseudo-tragium* | r. 2 | *Pirola* sp. |
| | | r. 1 | *Rumex* sp. |
| 1.2—3 | *Galium verum* | r. 1 | *Muscari latifolium* (fruits) |
| 1.2—3 | *Euphorbia* sp.? | r. 1 | *Campanula* sp. |
| 1.2 | *Pyrethrum poteriifolium?* | r. 1 | *Cephalanthera rubra* |
| 1.2 | *Festuca elatior?* | r. 1 | *Epipactis latifolia* var. *viridans* |
| 1.2 | *Hieracium* sp. | | |
| 1.2 | *Polygala supina* | r. 2 | *Allium phrygium?* |
| 1.2 | *Teucrium Chamaedris* | | *Asyneuma lanceolatum* |

In the upper part of the same stream there are fragments of *Pinus nigra* forest on more rocky substratum, where locally are dominant one or the other of the species given below. Especially *Sesleria argentea* is in places very abundant.

The vegetation in the immediate proximity of the rivulet was especially interesting and rich: shrubs, trees and herbs competed here in height. *Prunus Mahaleb*, generally considered as shrub, was noticed here as a tree, richly bearing small fruits. In addition to these I noticed *Alnus*, *Salix*, *Viburnum Lantana*, *Rhamnus Frangula*, *Evonymus latifolia*, *Sorbus Aria*, *Sorbus torminalis*.

As we went up the valley the slopes became steeper and steeper. The pine wood consisting of rather low trees (rocky substratum), had a rather poor herbaceous stratum, in which most often *Sesleria argentea* was noticed. The forest mingled here with the stream vegetation, until the altitude of 1500 m was reached. Here the pine woods ceased and gave place to the burned, dry, yellow steppe vegetation. It was represented by graceful grass *Piptatherum holciforme*, *Dianthus lydus*, *Herniaria incana*, *Paronychia anatolica*, *Acantholimon* sp., *Sedum Sempervivum*. It stood in strange contrast with exceedingly rich and dense shrub and herb vegetation hiding the swampy source of the Yaila-Chai. The floristic composition is seen from the list below.

A two metres high Umbellifer with pale yellow leaves and black fruits caught my attention at once. It proved to be a new species *Smyrnium galaticum* (Pl. XXXIII). While charmed by the fragrance of the flowers of the privet (*Ligustrum*), I observed with curiosity the pretty shining green beetles on them and tried to collect all the plants I had seen, my husband went on horseback up the steep slope and soon

reached the summit of Eldiven, which surpassed the spot by 150 metres only: he returned with rich yield in the form of *Stipa* sp. (probably *S. pontica* Smirn.), *Dianthus lydus* and most pretty *Scorzonera mollis*.

**Stream-bank community.** Valley of Yaila-Chai eroded in north-north-western slope of Eldiven-Dagh. Altitude: 1300—1500 m. (18. VII.). Sides — in the upper part — are rather steep and occupied, when facing north and west, by rather thin Black-Pine forests, when exposed to south and east — by the steppe vegetation. The total length of the valley is probably about 5—6 km. Vegetation was recorded from the middle and upper part.

---

Trees and shrubs:

| | |
|---|---|
| *Alnus glutinosa* | *Lonicera orientalis* |
| *Populus tremula* | *Rhamnus Frangula* |
| *Sorbus torminalis* | *Berberis crataegina* |
| *Viburnum Lantana* | *Salix purpurea* forma |
| *Ligustrum vulgare* | *Rubus* sp. |

*Prunus Mahaleb* — shrubs and small trees (4—5 m).
*Evonymus latifolia* — seldom, $4^1/_2$ m tall tree.
*Sorbus Aria* — tall shrubs.
*Pinus* spp. (*Pinus nigra*, *P. armena* or *P. hamata*) — trees of inferior height, which descending from the slopes to the bottom of valley only in the uppermost course of the stream mingle with the true river-side vegetation.

Tall herbs and grasses ($1^1/_2$—$2^1/_2$ m):

| | |
|---|---|
| *Smyrnium galaticum* | *Festuca elatior* var. *Fenas* |
| *Siler trilobum* | *Calamagrostis epigeios* |
| *Valeriana alliariaefolia* | |

Smaller herbs:

| | |
|---|---|
| *Allium phrygium* | *Solidago Virga aurea* |
| *Orchis incarnata* | *Carlina corymbosa* var. *graeca* |
| *Fibigia clypeata* | *Cirsium elodes* var. *indirisum* |

During one of the next excursions I made acquaintance — although very slight — with the rather destroyed vegetation of the plateau-like slopes of Eldiven-Dagh looking east. Here was an eroded ravine-like upper part of another stream, flowing directly to Arab. At the altitude

of about 1420 m this plateau represented a much grazed surface, covered here and there with small groups of shrubs, consisting of *Prunus Mahaleb*, *Lonicera etrusca*, *Rubus* sp. occasionally entwined with *Clematis Vitalba*. *Quercus* sp. I collected with great attention the last: they looked so very different from our European oaks, being shrubs with leaves but slightly indented, often spiny at the tops, covered with more or less dense stellate hairs. Near our camp — at 1200 m — they formed on the rocky ground quite a pure dense community with very poor ground vegetation. One of the oaks proved to belong to *Quercus infectoria* Oliv. ssp. *puberula* Schwrz., another — to *Q. longifolia* C. Koch.

The rocky slopes with southern exposure to the town of Arab, although very poorly overgrown, supplied a very interesting new species of *Paronychia* (*P. Beauverdi*, Pl. XXX, Fig. 2), which was growing together with *Paronychia anatolica*, the latter being rather common in the whole visited by us northern part of Central Anatolia. *Paronychia Beauverdi* — on the contrary — seems to be a very rare, strongly localized plant. Besides these, in fissures of rocks (serpentines and tuffs) were growing *Acantholimon* sp., *Vincetoxicum canescens*, *Elaeagnus hortensis*, *Onosma* sp. (*O. paphlagonicum?*), *Teucrium* sp.

The general appearance of the lower part of this rocky slope is well seen in the picture (Pl. XII, Phot. 23), where small tufts of herbs and grasses show much free space between them.

The town itself is a typical town of Central Anatolia with its houses of loam-walls and flat roofs. The only two whitewashed buildings are — the church (mechet) and school. The houses especially look depressing, being almost devoid of windows. Notwithstanding the presence of the trees in the neighbouring valley of Yaila-Chai, the inhabitants use for burning purposes a kind of manure mixed with strow, specially prepared for this purpose into small rounded cakes dried in the sun (Pl. XII, Phot. 24). The forest is probably saved thanks to the comparative difficulty of transporting the wood from the narrow valley, which has no road except a small path. — The pines nearest to the town, however, became quite like *Pinus Pinea* in habit thanks to the cutting off of the lower branches (Pl. XIII, Phot. 25).

Our way back to Changri was rather hurried and by the same way.

Summarizing the observations made in the massif of Eldiven-Dagh, we must state that on the deeper soils, at the altitude 1200—1300 m, rich steppe vegetation is developed, interspersed with the groves of *Pirus elaeagrifolia* and *Crataegus*. — On rocky substratum, at 1200 m,

very characteristic shrub communities originate, consisting up to 1300 m of oaks, higher up — of *Prunus Mahaleb*, *Lonicera etrusca*, *Viburnum*, *Berberis*, *Rosa* and *Rubus*.

The forest — here consisting exclusively of *Pinus* (*P. nigra*, and may be *P. armena* or *P. hamata*) — occupies in the form of thin woods the northern and western slopes, and is more fully developed on the sheltered sites, i. e. in the valleys. Its lower limit is approximately 1350 m, its upper — about 1500 m. Real forest types, such as *Pirola* and some *Orchidaceae* are already found. In the higher altitude — in sheltered, richly watered positions, appear the representatives of the North-Anatolian shady forest element, as for example *Valeriana alliariaefolia*.

**From Changri to Yailajik.** After a restless night in the same dirty "han" (inn) our party divided: Prof. Nikitin, with his assistant Zawadzki and Murat, started in an easterly direction — to Kutugun-Dere, about 70 km distant (on the Map 2 — near Bayat), while my husband and myself risked remaining three days without an interpreter and started to the north-north-east, our object being the imposing chain of Ilgaz-Dagh. The other party joined us after three days. As their aim was not at all botanical and they enriched my collections with only two plants, I dispence with all description.

Our purpose was to reach the Ilgaz-Dagh as soon as possible and to climb some summits to become acquainted with the alpine vegetation. The distance from Changri to the middle course of the Ilgaz-Su, which flows from the southern slope of this mountain-system, where we intended to pitch our tent, is about 80 km (60 km in a straight line). On July 20th we succeeded in making about two thirds of our way and passed the night on the slope above the river Devrez-Chai, in the region of shrub-oaks.

From Changri we followed quite a modern road, available even for automobiles, leading across the Ilgaz-chain to Kastamuni and the sea-port of Ineboli.

Leonhard in 1900 and Lebling in 1917 followed the same road. In describing it we shall make use of the experiences of both these travellers. The gypsaceous marls and conglomerates still continue for a distance of about 10 km to the north — to near Ayan — and do not give much opportunity for plant-collectors (especially at this late season). At the latitude of Kuleg (which town lies off the chief road) — the landscape represents gently undulating highlands not devoid of a certain charm. — On Kiepert's map it is given as Gülek-Dagh and according

to Leonhard (l. c. p. 68) its height varies from 1100 to 1400 m. Here the Paleogene rocks come again to the surface and they are represented by diabases, serpentines and slates (Kieselschiefer), islandlike basaltic greenstones are to be found. — At an altitude of about 1100 m *Asphodeline* appeared in great quantities, continued for some kilometres, and appeared again in abundance in the valley of the Ilgaz-Su. I have not collected it from the former locality, but I suppose that it is the same new species — *Asphodeline Wiedemanniana* — which grows in the Ilgaz mts., near Safranboli and so on. The first pine-trees appeared on the slopes looking west at 1200 m; although we crossed the country situated but 15—20 km to the west from Tukht — where quite dense forests of *Abies* begin — there was here no sign of *Abies*, and *Pinus* (probably *P. nigra*) was interspersed as single trees among cultivated fields. — At the altitude of about 1350 m, as we were approaching the river-divide, situated on the slope of Akhlat-Dagh, the fields (mostly wheat — very overgrown with species of *Avena* especially, *Althaea*, *Euphorbia* and *Onobrychis hypargyrea* — but a small one was sown with *Vicia Ervilia*!) covered with freshly green patches nearly the whole of the slightly undulating surface looking north-east. Probably these fertile grounds were formerly forests, because pines formed here and there small groves, and *Pirus elaeagrifolia* appeared in fields in great abundance. — Near the road the shrubs of the same *Pirus*, *Crataegus* and *Berberis* were seen, and in a small depression, which probably gave birth to a stream, a small patch of meadow-like vegetation displayed purple flowers of *Orchis maculata*. The slopes looking west are covered with the real steppe-vegetation, probably on account of a very shallow layer of soil, the plants being then in full bloom.

At the altitude of 1368 m (western slope of Akhlat-Dagh) this vegetation covers but 50—60% of the whole surface; there is but one layer of plants having a height of 10—30 cm. The composition is as follows:

| | | | |
|---|---|---|---|
| 2.2 | *Acantholimon* sp. | 1.2 | *Elymus caput Medusae* |
| 2.2 | {*Onosma paphlagonicum*<br>{*Onosma armenum* | 1.2<br>1.1 | *Melica ciliata*<br>*Cousinia*? |
| 2.1 | *Thymus* sp. | 1—3.1—2 | *Xeranthemum squarrosum* |
| 2.1 | *Teucrium polium*? | r. 1 | *Paronychia anatolica* |
| 1—2.2 | *Teucrium Chamaedrys* | r. 1 | *Digitalis orientalis* |
| 1—2.1 | *Astragalus* sp. | r. 1 | *Sedum album* |
| 1—2.2—3 | *Asyneuma* sp. | r. 1 | *Euphorbia* sp. |
| 1—2.1 | *Centaurea* sp. | | *Jurinea* sp. |

| | | |
|---|---|---|
| 1.2 | *Centaurea Czeczottiae* | *Galium aureum* |
| 1.2 | *Phlomis armeniaca* | *Scabiosa ucranica* |
| 1.2 | *Senecio vernalis* | *Zizyphora?* |
| 1.1 | *Dianthus* sp. | |

Here and there we noticed half a metre high shrubs of *Quercus* sp., *Juniperus Oxycedrus* and *Rosa* sp.; they were so sparse and so short. that the general impression of having to deal with a steppe community was in no way disturbed.

The river-divide, according to my measurements, is situated at 1524 m, while Leonhard gives it at 1425 m (Lebling repeats the same number, which he probably took from Leonhard). This great difference (about 100 m) is partly explained by the different numbers obtained for the position above the sea level of the town Changri (by way of comparison with which I computated all the heights on the way from Changri to the valley of Ilgaz-Su). Leonhard gives it as 730 m, while I found it to be 795 m (by the way it must be mentioned that the height of Changri given by Tchihatcheff is 895 m — this great difference originated probably from the different localities in Changri itself where the measurements were taken!). The future measurements, by more exact methods[1]), will prove which numbers are nearest to the real ones.

Till we reached the river-divide we did not pass a single dwelling place; near the river-divide, at the place called Karavan-Sarai, stood a single house, a "han". Here, besides wheat, we noticed also rye and the rather abundant shrubs of *Carpinus* (?), *Prunus* and *Crataegus*; a small depression bearing *Orchis* and *Thalictrum* (*T. angustifolium*?) betrayed the nearness of the underground water. Near the road itself I collected a very picturesque specimen of *Acanthus hirsutus* and noticed *Hedysarum varium*, *Tanacetum* sp., some white flowered *Salvia*, *Achillea* sp. *Cousinia* (?).

Behind the river-divide the trees cease and soon one enters, to quote Lebling (l. c. p. 108), "eine riesige flachwellige Andesitplatte", its medium height being 1400 m. Here and there, in small depressons, tiny lakes were seen. They might have offered a good object for the study of swamp and water vegetation but there was no time for this, because none of them were near enough to the road. The landscape is in general rather desolate: small pine-trees are seen very seldom among

[1]) I acknowledge that my measurements were taken mostly in a hurried manner and with one aneroid only.

these dry plains. With the beginning of the slope more and more oak bushes and small pine groves appear. The most picturesque part of the road begins when in many zigzags it descends down the slope of Ai-Dagh (?) to the Devrez-Chai. Quite nude perpendicular walls, bearing in fissures only *Ferulago pauciradiata*, give a splendid idea of the geological structure of this area. Under the andesite there is a series of volcanic rocks (tuffs, lava streams), and lower down the Neogene formation appears.

When approaching the small village of Inekeui (800 m), situated at the Devrez-Chai, we noticed on our left a perpedicular andesitic rock, which was riddled, as it were, by numerous square apertures. Attracted by this unusual sight we climbed a very steep slope and entered the lowermost cave, which had some indistinct carvings on the outside. Other caves were situated one and two storeys higher up and these latter proved to be inaccessible; on the rocky ledges of the upper caves were growing two shrubs of *Pistacia Terebinthus* and *Elaeagnus hortensis*.

The existence of such rock-caves has been established in numerous localities in Paphlagonia. They obviously represent the burial places of some ancient people (see Leonhard, l. c. pp. 69, 277—287).

All the space around was covered by steppe vegetation, which remained undescribed. My attention was only caught by some tall herbs, which were literally covered by beetles. They proved to be *Eryngium bithynicum*.

At Inekeui — while the horses were being watered — I took a photograph which may serve as a typical view of the river-bank landscape of Central Anatolia (Pl. XIII, Phot. 26). In the composition of these river-bank communities *Populus euphratica* participates most often, together with it are seen: *Morus*, *Salix*, *Hippophaë rhamnoides*, *Elaeagnus hortensis*, *Rubus* and *Clematis*.

We began to approach our place of destination. The last section of the road led, between the limestone range of Göhem-Dagh on the right and Neogene formations on the left, eastwards to the valley of the Ilgaz-Su. It was situated in the very heart of the mountains.

The chain of Ilgaz-Dagh, which has a general trend from W—SW to E—NE, is a mighty barrier dividing a part of the Central Anatolia from the coast of the Black Sea. The tectonic structure of the mountains can be well studied on the cross-sections which display the steep, often denuded slopes of the valley of the Ilgaz-Su and its affluent Sarajik-Chai (Pl. XIV, Phot. 27). They are formed of grey, green and reddish phyllites (Lebling, l. c. p. 108), clay-slates, and limestones supposed to

be of Paleozoic age (Nikitin, unpublished report), from below which protude porphyric dykes (Pl. XIV, Phot. 28); the phantastic appearance of the latter, combined with the extreme steepness of the slopes, creates a highly picturesque and varied landscape.

Higher up, at about 1700 m, quartzite conglomerates, clays, and nummulitic limestones of the Eocene age appear. The summit of Büyük-Ilgaz is built, as it seems, of limestone (the summit of Kush-Kayasy is probably also of limestone). Behind the pass Eocene deposits give place to diabases and again phyllites which continue to the village of Deirmen-Dere, where Noegene deposits — in the form of marls and sandstones — are noticed. They mark the northern limit of the whole Ilgaz-Dagh system (Lebling, l. c. p. 109).

Along the rivulet of Ilgaz-Su and on its slopes are situated numerous villages consisting sometimes only of a couple of dozen dwellings. The houses here are quite of another type than those from the Galatian highlands. They are one storey log-houses with verandas and sometimes ornamentation in front. The ground floor is predestined for cattle, the first storey serves as a real dwelling for men. The windows — if any at all are present — are very small, devoid of glass, and have only wooden lattices. This "pontic" type of house — as opposed to flat-roofed dwellings made of loam-bricks — is typical throughout the whole of this part of Northern Anatolia.

We stopped at the height of 1130 m, having on the right the highly picturesque upper part of the valley of Ilgaz-Su, in the background of which the mighty mass of Büyük-Ilgaz-Dagh is situated, and almost in front — the side-valley carved on the slope of another high summit — Kush-Kayasy. The stay of 6½ days in this place enriched my collections with many specimens, and my memory with the most charming reminiscences of beautiful scenery.

Such a long stay was ordered to enable us to make the long expected ascent of subalpine and alpine regions, and besides this the second half of our party was to join us after 3—4 days.

Notwithstanding that in the neighbouring valley — near Tossia — was the chief abode of the well known collector Sintenis for a longer stay, we succeeded in finding some fine new species.

**Yailajik (Ilgaz-Dagh).** Our camp was situated in the zone of xeromorphic shrubs, known already from Tukht. Arab and so on. The composition was already a little different: oaks were absent, but *Cotoneaster nummularia* was represented by stately shrubs, as well as *Juniperus*

*Oxycedrus*. The stratum of herbaceous vegetation was much eaten at this time of the year. The slope behind our tents rose so abruptly, that it was not very inviting for an excursion, and I limited myself to a climb of 50 metres, where already rather nice pine-trees grew — although very sparse — and from where I could photograph the general view of the most picturesque panorama which opened before my eyes (Pl. XV, Phot. 29). It was obvious that the region of struggle between steppe and forest, which began a score or so of kilometres to the south — near Tukht — continued here: the whole of the slopes facing south were either bare or covered with sparse shrub vegetation, those facing north, west, and north-west — bear forests (as we shall see farther on, in the upper part of the same valley the forest preponderates and all slopes are already clad with coniferous forests).

In the immediate proximity of our camp (which was situated a little apart from the village Yailajik — to avoid the crowd of curious people), we had: the vegetation of very stony and rocky escarpments, a little below us — fields were seen — some of them just fallow. In the rocks I found an interesting *Vincetoxicum* (*V. fuscatum* Rchb.) and some steppe plants, which were more numerous on fallow fields. The field was partly surrounded by shrubs of *Colutea cilicica* f. *melanotricha*, and *Crataegus* sp.; *Reseda luteola* was seen in great abundance. The loamy excarpment provided me with a rich collection of steppe plants, as for example: *Scutellaria orientalis*, *Glaucium corniculatum*, *Scabiosa ucranica*, *Xeranthemum squarrosum* — found in fine blossoming specimens. Nearer to the bottom of the valley numerous trees of *Juglans regia* grew as if they had not been planted, and near the "aryk" (canal of irrigation) *Rubus mostariensis*, in splendid individuals densely covered with crimson flowers and entwined with *Clematis Vitalba*, attracted masses of insects. One still felt the nearness of the steppes, which we had left behind us: one remembered it by seing the numerous representatives of the steppes (named above); but still one felt already the presence of a different region — the region of the mountains, a region — on the one hand more rich in Mediterranean vegetation — on the other hand in forest species. The mountain air made itself felt during the night, when probably on account of a considerable lowering of the temperature — a serpent sought refuge in our tents, and the two Turks, who accompanied us, found it in the morning lying close between them. Startled by their cries of terror it hurriedly disappeared.

The measurements of temperature during 7 days gave us the following data:

| Locality and altitude | Time of day | morning | | afternoon | | evening | |
|---|---|---|---|---|---|---|---|
| | Date | hour | temperature C | h | t | h | t |
| Yailajik (Ilgaz-Dagh) ca. 1130 m | 21. VII | — | — | — | — | *20* | 18.5° |
| | 22. VII | *9* | 17.5° | — | — | *21.30* | 18° |
| | 23. VII | *7.30* | 13.5° | — | — | *21.15* | 18.3° |
| | 24. VII | *9* | 16° | — | — | *22.30* | 17° |
| | 25. VII | *9* | 16° | *12* | 23.2° | *21.15* | 18° |
| | 26. VII | *7.30* | 14.5° | *12.15* | 23° | *23* | 16° |
| | 27. VII | *8* | 16.5° | — | — | — | — |
| | | Medium: | 15.7° | — | 23° 23.2° | — | 17.3° |

It is clear — even after such a short period of meteorological observations — that the climate (as compared with our former stations) is more mountainous, less continental, having the general course of changes of temperature more equal, without great differences between the temperature of day and night.

**Excursion to Kush-Kayasy.** Although our first high-mountain excursion was to the summit of Büyük-Ilgaz Dagh, I shall begin with the description of Kush-Kayasy, which we climbed only on the fourth day of our stay in Yailajik, because, being situated nearer to the interior of Anatolia, it gives us a better idea as to how the transition from steppes to forests occurs.

The outer appearance of the summit is well seen in the picture (Pl. XV, Phot. 29). From far it seems devoid of tree-vegetation, in reality it possesses it, but it is hidden beyond the opposite crest, on the slope looking just opposite — to the north.

Before beginning the real ascent, we were obliged to follow a few kilometres along the chief road in the valley of Ilgaz-Su, passing two villages. Masses of violet and white *Salvia* (*S. cyanescens*, *S. candidissima* etc.) again greeted us. They were extremely abundant on both sides of the road. Both slopes of the valley were in places nearly precipitous and a near view sometimes displayed very curious and picturesque forms of isolated rocks created by erosion and weathering processes (Pl. XIV, Phot. 28). The villages situated on the slope of Kush-Kayasy were very rich in fruiting trees (walnuts, peaches and

so on). Soon above the last village, a very dried and nude slope began, which was so probably on account of its southerly exposure. The most picturesque plant which embellished this slope was *Morina persica*. At the height of 1520 m the plant covering consisted of:

| | | | |
|---|---|---|---|
| 2.2 | *Thymus punctatus?* | r—1.1 | *Scutellaria orientalis?* |
| 2.2 | *Plantago carinata?* | r.1 | *Asperula* sp. |
| 2.2—3 | *Onobrychis cadmea* | r.2 | *Sedum glaucum?* |
| 1—2.1 | *Minuartia?* | r.1 | *Scabiosa ucranica* |
| 1—2.2 | *Festuca* sp. | | *Morina persica* |
| 1.1—2 | *Galium* sp. | | *Alyssum obtusifolium* |
| 1.1 | *Hieracium* spp. | | *Potentilla* sp. |
| 1.1 | *Teucrium polium* | | |

At the altitude of 1700 m a pretty grove of *Pirus elaeagrifolia* appeared (Pl. XV, Phot. 30) and above it stood out the summit of imposing Büyük-Ilgaz-Dagh.

At the altitude of 1780 m appeared the first shrubs — this time — of the subalpine zone. They were *Crataegus* spp. and *Daphne pontica*. We must notice here that the latter is one of the representatives of the South-Euxine element, which spreads farther to the south, than either of the others[1]).

At 1830 m there are still cultivated fields. On their margin plants of *Allium rotundum* with pretty green beetles on them were gathered. The first shrubs of *Juniperus nana* appeared. Thus we entered the subalpine region. Beginning with 1910 m, sweet smelling *Daphne oleoides* accompanied in great abundance the dense shrubbery of *Juniperus*. *Hypericum polygonifolium* was often seen. The isolated trees of *Pinus nigra* indicated the possibility of the existence of forest here. On the ridge, which we followed climbing up higher and higher, at 1950 m, to my surprise, *Stipa* (*S. pontica*) was noticed, as if it was a subalpine plant. The crest bends to the west and at 1964 m — under the cover of the opposite slope behind the valley, there is a scrap of much destroyed *Abies* forest (Pl. XVI, Phot. 31). Although strongly cleared it conserves — as I have noticed — many species typical of shady forests. In its composition it proved to partake of the species given in the record below:

[1]) Nowack mentions it from the mountain cone of Ishik-Dagh, where it grows among pines (53, p. 421), Tchihatcheff — from the eastern part of the Dumanich-Dagh in Mysia, also much to the south but also to the west from where we were (81, Geologie I, p. 406).

***Abietetum Nordmannianae.*** Altitude 1940 m. Exposure: NW. (26. VII.). Much destroyed forest occupies a depression under the summit of the Kush-Kayasy, remaining under the protection of the opposite slope of the valley. Soil: very stony on a limestone underground. (Phot. 31.)

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Tree stratum:

3—5.2—5 *Abies Nordmanniana* var. *leioclada* — very irregularily distributed on account of the presence of much destroyed places. but locally, where the denser groups remained untouched. forest seems to conserve all its characteristic features.

r. 1 *Pinus nigra* — solitary trees on the outskirt of *Abies* wood.

Shrub stratum:

2—3.3 *Daphne pontica* — keeps close to the pine-trees.
*Juniperus nana*

Ground stratum — about 10% of the surface cover consists of protruding stones, the remaining part either bears herbaceous vegetation, or — in places where *Abies* trees keep very close together — is devoid of any vegetation and covered with fallen needles.

| | | | |
|---|---|---|---|
| 2—3.2 | *Poa nemoralis* | 1.1 | *Bromus asper* |
| 2—3.2 | *Sesleria argentea* | 1.2 | *Campanula* sp. |
| 2.2—3 | *Ranunculus Brutius* ssp. *anatolicus* | 1.1 | *Lathyrus* (*Orobus*) *sericeus* |
| | | 1.1 | *Myosotis silvestris*? |
| 2.2 | *Hieracium murorum* ssp. *oblongum* var. *abieticolum* | r. 2 | *Silene inflata* |
| | | r. 1 | *Hypophitys* sp. |
| | | r. 2 | *Valeriana alliariaefolia* — in thickets of *Daphne pontica* |
| 1.2—3 | *Saxifraga rotundifolia* | | |
| 1.2—3 | *Pirola secunda* | | |
| 1.2 | *Asperula involucrata*? | | *Sanicula europaea* |

At 2050 m the forest ceases, only some solitary pines and firs remain. A little higher up the crest becomes very narrow. because here approaches the upper part of the valley. having the general trend S–N and which probably gives birth to Balyk-Su; dense shrubs of *Juniperus nana* reache almost to the very path, among them, several metres lower down, appears first large trees, singly and in groups, of *Abies Nordmanniana* var. *leioclada*. Lower down they form vast forests covering all of the slopes of this valley looking north (Pl. XVI, Phot. 32). The character of the

upper limit of *Abies* forest was seen exceedingly well. Shrubs had the appearance of having been cut to the same level, and they ceased a little below the watershed, as to the trees — they gradually became lower and lower as they approached up to the watershed, always keeping below the height of the crest. It was obvious that shrubs and trees were kept in their height by the obnoxious influence of the dry winds blowing from Interior Anatolia. Higher up the *Juniperus nana* shrubs continued nearly to the summit, becoming, gradually as we climbed, lower and thinner.

At 2120 m we passed a small meadow, which owed its existence to a small spring having its source on this slope. My attention was struck by the great quantity of *Alchemilla* (*A. erythropoda* Juz.), and the very beautiful *Primula auriculata*, which was found here in abundance. To the right we left the smaller summit, consisting of precipitous nude limestone rocks, and followed the gentle slope of a much higher summit — shrubby and grassy and having a rounded form. Behind us we noticed the camp of the Kurds in the valley below. Their smoked black tents looked from above like a row of ant-hills. The dogs barked furiously and a crowd of children and grown up people peeped curiously at the unexpected visitors to their mountains. Fortunately we were too far from them to be disturbed in our ascent. We noticed the cruel custom of the Kurds, namely, to leave their donkeys with heavy wooden saddles on their backs even while resting and grazing. — Our horses stumbled on the more and more abundant stones, we left them at 2248 m and continued to climb on foot. Even here 70% of the surface was covered with *Juniperus nana*, but its height did not exceed 5—10 cm. It gave abode to *Saxifraga rotundifolia* and *Daphne oleoides*, which soon ceased. Among them, on rocky substratum appeared crowds of *Campanula*, *Erigeron*, *Polygala*, *Pedicularis*, *Potentilla*, *Gentiana*, *Asperula* — all very small but pretty and very bright in colour. Soon more abundant and tall bunches of *Festuca* appeared. We were among alpine vegetation, which was studied more thoroughly on the summit itself. The following list shows the composition:

**The alpine vegetation** on the summit of Kush-Kayasy (in the chain of Ilgaz-Dagh). Altitude about 2400 m (26. VII.).

| | | | |
|---|---|---|---|
| 2.3 | *Onobrychis cadmea* | 1.2 | *Thymus punctatus* |
| 2.1 | *Helianthemum rupifragum* f. *orientale* | 1.1 | *Bromus cappadocicus*? |
| | | r. 1 | *Erigeron pulchellum* |

1—2.2 *Festuca orina* var. *paphlagonica*
1—2.2 *Scorzonera nutans*
1.2—3 *Sedum glaucum* var. *eriocarpum*
1.1 *Poa alpina* var. *brevifolia*
1.1 *Asperula nitida* var. *hirtella*
r. 1 *Astragalus Nabelekii*
r. 1 *Juniperus nana*
*Galium erectum?*
*G. orientale* var. *alpinum*
*Draba olympica* var. *bruniaefolia*
*Minuartia erythrosepala*
*Alchemilla erythropoda*

On the slope facing north. 50—120 m lower down we find some other species also. or the same, but in another quantitative proportion:

2—3.3 *Potentilla alpestris* var. *typica*
1.2 *Asperula nitida* var. *hirtella*
1.1 *Hypericum polygonifolium* var. *paphlagonicum*
1.1 *Trifolium* sp.
r. 1 *Myosotis* sp.
*Centaurea cana*
*Gentiana verna* var. *alata*
*Polygala supina?*
*Pedicularis Wilhelmsiana*
*Festuca orina* var. *paphlagonica*
*Sesleria argentea* (at about 2300 m)
*Cetraria?*

As we see the alpine vegetation consists of species quite different to those of the Middle-European high mountains. In its lower part the alpine zone seems to have many features in common with the Greek mountains and those of the Transcaucasia. Here and there the prominent part, physiognomically and floristically, is played by of *Juniperus nana* and *Daphne oleoides*. Save these, not many species are found common to all the alpine summits of Asia Minor and still less to the Asia Minor mnts. and those of Greece. — Whereas in Europe the Great Glacial Period led to the descent of alpine species downwards and consequently enabled them afterwards to reach many mountain systems far distant from each other, here — in Asia Minor — where the Glacial Period displayed itself in a very inconspicuous degree of glaciation, the alpine flora of each massif and chain passed its own cycle of evolution and the isolation favoured the creation of forms peculiar to this or that system only[1]).

[1]) Some interesting considerations on the problem of the alpine vegetation in Asia Minor are to be found in Tchihatcheff's two papers: "Etude sur la végétation des hautes montagnes de l'Asie Mineure et de l'Armenie" (82) and "Klein-Asien" (83, p. 57—60).

On the summit of Kush-Kayasy we did not notice any traces of glaciation. — Of the plants which struck our attention most we must name: *Asperula nitida*, which with its vividly pink flowers full of charm played physiognomically the same part as *Silene acaulis* in our European mnts. Again, large cushions of *Scorzonera nutans* (one of our new species), with its *Gnaphalium*-like leaves and thick woody root system, allowing one to suspect the great age of some specimens (attaining sometimes over 50 years) represented something incomparable (Pl. XXXVI). As the cushions were level with the surface, they might have remained unnoticed, had it not been for the desire to make a full list of alpine plants and hence a very attentive study of the surface. — From the great amount of *Festuca* the association could be probably named *Festucetum paphlagonicae*. *Astragalus* found on the summit is one of the prettiest of the Genus, being the representative of the section characterized by soft silky leaves and the total absence of thorns.

A far reaching view from the summit opened before us: the continuation to the south-west of the Ilgaz-chain — nude and yellowish and not extending very far; before us streched, like gigantic steps, lower and lower mountain massifs of: Göhem-Dagh, Kush-Dagh, and in the far distance — Panair-Tepe. We recognized bluish countours of slightly wooded Eldiven-Dagh. — While it was clear that Panair belongs already to the wooded ranges constituting a broad belt of a 100 km in width of Northern Asia Minor, Eldiven stood as an isolated mountain cone surrounded by highland steppe plains. Behind us extensive coniferous forests covered all slopes, without difference whether they faced to the north, south, west or east.

We devoted to the study of this forested zone most of our excursions and noticed with great interest at what height and on which slope appeared and disappeared the two kinds of *Pinus* present here (*P. silvestris* and *P. nigra* var. *Pallasiana*), and *Abies Nordmanniana* var. *leioclada*.

**Excursion to Büyük-Ilgaz-Dagh.** On the slopes of the highest summit of the whole chain — Büyük-Ilgaz-Dagh — I botanized twice. The first time, with the purpose of reaching the summit we spent one whole day on its slopes. The second time — on our way to the north — when we were obliged to pitch our tents near the pass, at an altitude of above 1740 m, and spend one night among the splendid forests covering the northern slope of Büyük-Ilgaz (Pl. XVII, Phot. 33, 34). On both occasions we followed the same road to the pass. Those who wish to reach the summit, have to follow a scarcely visible path up to the right

6*

from off the pass itself. At first it leads through a gloomy, extremely dense *Abies* forest, which soon merges into brighter pine-forest, because the path from the northern slope turns to the eastern and finally — to the south-eastern slope.

As the day of our excursion, planned so long beforehand, happened to be gloomy, with the clouds creeping along at the altitude of the pass and which soon burst into a fine drizzle, we followed our way up on mules rather hurriedly, for fear of not being able to descend before darkness. The fir-forest was passed without descending from the saddle. I noticed a great amount of *Saxifraga rotundifolia*, *Pirola* spp., and *Asperula involucrata* growing in herds. An interesting swampy glade, which we passes by, reminded me of some spots in the "tundra" of Western Siberia or interforest meadows in the Mongolian Altai mnts. by the luxuriant growth of herbaceous vegetation. There were growing *Polygonum* (probably *P. Bistorta* L.), *Valeriana alliariaefolia*, *Geum rivale* — all about 1½ m in height. The *Abies* forest changes rather abruptly into *Pinus* forest, which after the gloomy but impressive fir-forest strikes one by the low growth of its trees. It is constituted of *Pinus silvestris*. Soon the forest ceases and one enters a wide, slightly undulating subalpine meadow which, being strongly grazed, leaves little for collectors. A brook cut it flowing in a southerly direction. — Quite unexpectedly a Kurd camp arose before us, which it was impossible to avoid as we were soon noticed by the inhabitants. Almost against our will we were obliged to enter one of the black tents where, as it seemed, most of the male population were just collected warming themselves at the big fire on account of the damp weather prevailing. Huge knives stuck in their belts, gloomy looks and incomprehensible speech, which sounded rather rough to our ears — they did not make a very inviting impression, still more so, as we were in a great hurry to continue our ascent and were delayed only to satisfy the curiosity of the Kurds. — We noticed with satisfaction the presence of a Turkish policeman (from the police-station situated at the pass), who happened to have entered the tent a little before us, and having learned from the Turks accompanying us, who we were and with what purpose we climbed the mountains — tried to convince our too hospitable hosts not to detain us any longer. — The meadow and the camp of the Kurds must have been situated at an altitude of about 1900 m. I am sorry to state, that — probably on account of the rainy weather and low passing clouds — the altitudes of different localities on our excursion were determined very imperfectly. It is still more to be regretted in that directly

after passing the camp, we entered a magnificent *Pinus nigra* forest, in which a rather important discovery was made. Notwithstanding the great fatigue from the long ride and still more from the foggy and rainy weather, we were struck by the presence of the numerous walls, running parallel with each other and situated, as it seemed, according to the contour-lines of the slope. They were 2—3 metres high and were overgrown by pine-trees. The slope here (at the height of about 2000 to 2100 m) was rather gentle, but it passed to the right — as it seemed — to a very abrupt slope; to the left was seen wildly ragged limestone (?) rocky crest, leading directly to the summit. Small solitary pines were seen growing in clefts of this almost vertical wall.

We continued our ride — but slightly ascending — following the path which ought to lead us to the summit from the southern side — where there was a more easy access to the summit. The morainic (?) walls continued probably for some kilometres. — To gather strength for the ascent, we made a short stop, trying in spite of foggy weather to photograph the forest (Pl. XVIII, Phot. 35). A morainic wall was caught in our picture, which fact supported my supposition that on the Büyük-Ilgaz-Dagh we probably met with the moraines of ancient glaciers. As the precipitation-bearing winds blow in Northern Anatolia from the north, the snow fields and glaciers would consequently develop on the southern slopes, which has been most probably the case on Büyük-Ilgaz[1]). The existence of the previously mentioned ridge probably favoured the accumulation of snow under its cover and the latter — converted into glaciers — probably did not descend lower than the beginning of the abrupt decline to the right.

On the spot itself we had no knowledge as to how the question stands with the glaciation of Asia Minor and therefore did not pay due attention to these very important remnants of the Glacial Age. Only long afterwards I learned that no traces of glaciation have been known from Northern Asia Minor, save from Mt. Olympus[2]).

[1]) Some mistakes have crept into the note published on that subject in The Geographical Journal, vol. LXXIV, No. 4, p. 412 (1929): (1) the late Prof. Czeczott was not a professor of the Botanical Institute of the University, but of the Mining Academy of Cracow; (2) the correct orthography of the Paphlagonian range on which the presumable traces of glaciation have been found, in accordance with its pronunciation by the natives and the transcription used on recent Turkish maps, is Ilgaz-Dagh, and of the highest summit — Büyük (Great) Ilgaz-Dagh.

[2]) Leonhard, who crossed the road Ankara-Ineboli in 1900 (42, p. 70) wrote: "Die gerundeten Formen der Kämme und Gipfel zeigen, daß glaziale Ein-

A few score of metres below the summit there is a small space free of wood, densely overgrown with *Asphodeline taurica* and a new variety of *Nepeta nuda*. As we entered this on leaving the forest, a beautiful picture presented itself to our eyes: a shepherd with his long loose sheep-skin cloak over his shoulders stood in the midst of a flock of Ankaran goats and sheep, which were kneeling around him and quietly ruminating. At this moment the sun peeped put and illuminated the scene for a moment, leaving an unforgettable reminiscence. — The meadow was surrounded by pine forest. Very sparse but thick and quite normally developed *Pinus nigra* trees were partly destroyed by the barbarous custom of the shepherds, who make their fire near the foot of the trunks. — The trees followed a score of metres up the extremely steep slope. Our Turks declined to follow us, repeating an incomprehensible word "delikopek". This proved to be the name of the shepherd's dogs, which are very savage and are said to spring at the throat of every newcomer. They are kept especially to guard the herd against thieves and are as fierce as wolves. Fortunately they were absent for the moment and we climbed and descended the summit without being attacked by them. — The last trees were of a very curious shape, being only 5—6 metres in height but stretching their strong thick branches out to about 15 metres[1]). Their branches began very low, leaving only about 1½ metre of trunk bare. I did not collect any specimens from those trees, but noticed that they had long green needles — which is characteristic of *Pinus nigra*. — The steep slope between the trees and above them was covered with *Festuca ovina* ssp. *phrygia* and *Festuca Woronowii*, with a strong admixture of a sweet-smelling pink (*Dianthus ilgazensis*). Besides these one could notice growing in great abundance: *Sesleria argentea* and *Daphne pontica*. Only 60% of the surface was covered with vegetation. Among the tufts of grasses were seen the most beautiful *Centaurea cana*, *Pedicularis Wilhelmsiana* and *Polygala supina*.

The summit — according to our measurement — was 2223 m high, but this figure is surely wrong. Leonhard obtained for it (when measur-

wirkungen für ausgeschlossen gelten können" (see Pl. LVIII, Phot. 36). He is more cautious in another passage (l. c. p. 222) when writing: "Für letzteres Gebirge (i. e. Ilgaz-Dagh) muß allerdings die Möglichkeit offen gelassen werden, da ich den mittleren Teil nicht besucht habe. Immerhin konnte es sich nur um isolierte Vorkommen von geringer Ausdehnung handeln".

[1]) How disproportional the pines were, the following dimensions show: total height of tree — 2 m, height of trunk — about 1 m, width of outstretched branches — 10 m; another tree again, having but 2½ m in height, had 40 cm in diameter.

ing from the high-road) 2350 m. On labels Sintenis gives even 2710 m. Although the considerable height of the summit was also proved by the low temperature of this gloomy wet day (while trying to write an account of the alpine communities occupying the summit my hands were frozen: I could hardly hold my pencil), we think that the last figure is too high. For Kush-Kayasy — another summit in the same range — an altitude of 2400 m was obtained, and seen from that mountain-top Büyük-Ilgaz-Dagh indubitably surpassed it in height. Taking all this into consideration we assume the altitude to be in all probability about 2500 m.

The summit represented a small cupola-like space, cut abruptly from the northern side and descending by gradual steps to the ridge, which we saw when approaching the summit. — It was late and no time to be lost. Hurriedly, under dense fog, we tried to collect whatever there was to collect. The grassy slope passed to depressed low vegetation, leaving much free space between the individuals. The space below us — to the north — was filled with clouds and fog and seemed to be dangerously precipitous, even causing giddiness. It is clear from the photograph (Pl. XVIII, Phot. 36), that if ever glaciers existed on Büyük-Ilgaz, they could not have developed on this steep side, but only on the opposite southern, south-eastern and south-western sides, which had less precipitous and terrace-like, more level, spaces.

The vegetation consisted of *Juniperus nana*, which avoided, however, the very summit; it was accompanied by *Daphne oleoides*. 40% of the surface consisted of bare gravelly spots and outcropping rocks (limestone). The adjoining list of plants shows the composition.

***Junipereto-Graminetum*** on the summit of Büyük-Ilgaz-Dagh, at the altitude of about 2500 m. Exposure: S-SE. (24. VII). Herbs and grasses about 25 cm in height.

| | | | |
|---|---|---|---|
| 3—4.3 | *Juniperus nana* | 2—3.2 | *Thymus punctatus?* |
| 3—4.3 | *Sesleria argentea* | 2—3.2 | *Scutellaria orientalis* |
| 2—3.2 | *Avena versicolor* var. *subcondensata* | 2—3.2 | *Onobrychis cornuta* |
| 2—3.1—2 | *Poa alpina* var. *brevifolia* | 2—3.2 | *Hypericum polygonifolium* var. *paphlagonicum* |
| 2—3.2 | *Helianthemum nitidum* f. *glaucescens* | 2.2 | *Daphne oleoides* var. *jasminea* |
| 2—3.2 | *Potentilla alpestris* var. *typica* | 2.2 | *Asperula nitida* var. *hirtella* |
| | | 2.1 | *Galium erectum?* |

| | | |
|---|---|---|
| 1—2.2 | *Saxifraga* sp. | *Festuca ovina* ssp. *phrygia* |
| 1—2.2 | *Polygala supina* | *Aethionema paphlagonicum* |
| 1—2.1 | *Dianthus ilgazensis* | *Bunium Bourgaei* |
| 1.1—2 | *Draba olympica* var. *bruniaefolia* | *Asyneuma obtusifolium* |
| r—1.1 | *Iberis olympica* | *Helichrysum graveolens* (devoid of flowers) |
| r—1.2 | *Scorzonera nutans* | *Stipa pontica* |
| r—1.1 | *Erigeron pulchellum* | *Scutellaria orientalis* var. *pinnatifida* |
| r—1.2 | *Sedum glaucum* var. *eriocarpum* | *Androsace villosa* var. *dasyphylla* |
| r. 1 | *Astragalus ilgazensis* | |
| r. 2 | *Veronica Fuhsii?* | |
| | *Festuca varia* var. *Woronowii* | |

A little below the summit — on the southern slope — *Stipa pontica* was found. The cryptogamic vegation was strikingly poor, mosses were totally absent, of lichens — only a *Cetraria* occurred.

A comparison of the records made here and on the summit of Kush-Kayasy — in the same mountain chain — shows us how very near is the composition of the vegetation. In this way we gained a rather satisfactory idea of the composition of the alpine vegetation. If compared with the alpine vegetation of Europe (from the Alps, the Carpathians and the mountains of the Balkan Peninsula) it differs by the absence of many genera and the presence of species peculiar to the Nearer East. We were struck for instance by the almost total absence of *Alchemilla*, by the great scarcity of *Gentiana*, *Chrysanthemum* and so on, by the total absence of the arctic element, which at this height (above 2200 m) might have been present.

On our way back we took another way: shorter, but on account of the extreme steepness quite impossible for mules and horses to go up. Twice the steep slope changed to more level spaces, where — still in the subalpine zone — a real meadow appeared, with dense grassy vegetation. A stream was obviously the cause of such an unusual mesophytic vegetation here. In the meadow *Centaurea axillaris* var. *cana* grew in great abundance, *Veratrum nigrum* (?), in 30—40 m high specimens, was noticed. Our way down lead through a very beautiful pine forest, consisting from the summit to the bottom of the upper part of the valley of Ilgaz-Su — of *Pinus nigra* var. *Pallasiana*. Shrubby undergrowth was lacking. The most abundant species which I noticed in the herb stratum of this forest was *Hieracium* (*H. maculatum* and *H. auriculoides*)

and the very pretty *Vicia tenuifolia* ssp. *variabilis* var. *virens* Freyn (list of species met with in this forest is given below). As we passed a burnt place, we noticed splendid huge individuals of some *Cephalaria* (probably *C. procera* Fisch.) which, however, remained uncollected.

***Pinetum nigrae*** on the slope of Büyük-Ilgaz-Dagh. Altitude 2000—2100 m. Exposure: S and SSE (24. VII). Very thin yet stately forest.

---

Tree stratum:

| | |
|---|---|
| | *Pinus nigra* var. *Pallasiana* |
| | *Pinus silvestris?* |

Shrub stratum:

| | |
|---|---|
| | *Juniperus nana* |
| 2—3.2 | *Daphne oleoides* var. *jasminea* |
| | *Daphne pontica* |

Ground stratum:

| | |
|---|---|
| 2—3.2 | *Festuca montana?* |
| 2—3.2 | *Sesleria argentea* |
| 2—3.2 | *Bromus cappadocicus?* |
| 2.2—3 | *Pteris aquilina* |
| 1—2.2 | *Veratrum nigrum* (30 to 40 cm in height, fruiting) |
| 1—2.1 | *Polygala anatolica* |
| | *Primula acaulis* |
| | *Thymus* sp. |

Beginning from here are included species met with in the same pine-forest when descending south-south-eastern slope:

| | |
|---|---|
| 2—3.2 | *Hieracium maculatum* var. *Anatoliae* |
| 2—3.2 | *Hieracium auriculoides* |
| 1.1 | *Helichrysum graveolens* |
| | *Campanula olympica* |
| | *Lapsana grandiflora* |
| | *Trifolium armenium* (locally in crowds) |
| | *Onobrychis cadmea* |
| | *Vicia tenuifolia* var. *virens* |
| | *Centaurea axillaris* var. *cana* (on wet interforest meadow) |
| | *Veronica Fuhsii* |

We followed from the poor village of Yaila — quite cut off from the outer world and lost in the deep forests — the bottom of the valley, which struck me: 1. by the presence of great masses of *Hippophaë rhamnoides* and 2. the presence of miserable looking woods consisting of trees of very inferior dimensions to those passed but a short time before on the south-south-eastern slope of Büyük-Ilgaz-Dagh; probably they

consisted of another kind of pine — may be *Pinus silvestris* or *Pinus armena*, which species both occur in this part of Anatolia. — When following down the valley I tried to understand according to what law the different kind of trees were distributed on the slopes.

1. In the lower zone *Pinus nigra* var. *Pallasiana* appears at an altitude of 1330 m: it occupies there the northern and western slopes, leaving the sunny hot southern slopes to open shrub communities or xeromorphic scrub steppes (Pl. XIV, Phot. 27).
2. First pioneer firs (*Abies Nordmanniana* var. *leioclada*) make their appearance at 1690 m; they grow, intermixed with pines, on the northern slopes.
3. With the increasing altitude the pine gives way on the northern slopes, leaving them to the extensive forest of fir: it covers large tracts of the southern and south-eastern slopes.

Such a relation we have noticed already at 1380 m, while a little higher there is already strong admixture of *Abies* to the pine-woods. Gradually as the bottom of the valley becomes wider, the forest keeps to the steep slopes and especially to the small side ravines and valleys — as if to avoid the hot breath of the steppe region lying to the south. The bottom is occupied by some tall grasses, growing on marshy ground, which is probably often inundated, and dense thickets of willows and *Hippophaë*, which keep to the nearest proximity of the stream. Such was the state of things at about 1400 m.

Lower down the valley broadens, villages appear one after another, surrounded by cultivated fields. The shrubs near the stream disappear, the forest on the slopes gets thinner and smaller and spaces occupied by the steppe and shrub communities become larger and larger.

**From Yailajik to Kastamuni.** We studied more thouroughly the *Abies*-forests and subalpine vegetation when, on the next day, followed for the last time the high road — with the purpose of reaching Kastamuni. The night was spent in the very midst of high-mountains, enabling us to make several records of the forest communities on the slope of Büyük-Ilgaz and the slope — on the opposite side of the high road.

Before passing to the discussion of observations made there, I must point out that almost up to the very pass (1900 m) steppe plants were noticed in the forest zone; they occupied every free space looking south near the road, space created by fallen ground and so on. They represented the same steppe species (and some new to me) as in the lower zones, and were just in full blossom — not dried and not in fruiting

state. Thus I collected very beautiful specimens of *Tragopogon coloratum*, *Onosma paphlagonicum*, *Zizyphora capitata* and some others.

Our camp was situated this time at the height over 1700 m (being the highest camp during our travel in Anatolia). Although in full summer we were nearly frozen in the night. The temperature at 10 o'clock in the morning was only 10° C.

Near the road there was a glade used probably often for camping purposes by the travellers, for ruderal vegetation consisting of *Spiraea Ulmaria*, *Urtica*, *Agrimonia Eupatoria*, and many others was abundantly present, but, in view of more attractive virgin forests, surrounding us from all sides, it remained undescribed. The forest on the left side of the high-road consisted of stately pine trees which a 100 metres higher up passed — by gradual thinning — into subalpine meadow, full of blossoming herbs and grasses. Want of time did not allow me to describe in full this vegetation. I have seen it at close quarters only on the transitional zone between scattered pines, at the upper limit of the forest. Among dense low shrubs of *Rubus tomentosus* var. *canescens* richly fruiting *Fragaria vesca* was noticed. *Dorycnium latifolium*, *Trifolium rivulare* (reminding one of our *T. Badium*), and sweet smelling *Trifolium armenium*, with large capitula, grew in abundance.

To the right of the road the slope abruptly descended to a mysterious looking valley, which divided us from the summit of Büyük-Ilgaz, looking from this side quite inaccessible (Pl. XVIII, Phot. 36). It was on the northerly slope, full of bubbling streams and densely covered by the gloomy, extremely shady *Abies* forest. For each community I could write only one account. The floristical composition and some details referring to these communities are to be found below:

***Pinetum nigrae*** on the slope of Büyük-Ilgaz-Dagh (slope to the road Ankara-Ineboli). Altitude: about 1710 m. Exposure: SE and E. (28. VII.) Through the forest consisting of stately pines are seen, but 50 m higher up, the subalpine meadows. Distances between the trees are 2—3 m. Circumference of the thickest trees: 220 cm, of medium trees — 150 cm. Fir-trees, also present, are much lower than pine trees.

Tree stratum:

| | |
|---|---|
| 3—4.2—3 | *Pinus nigra* var. *Pallasiana* — about 25 m in height. |
| | *Pinus silvestris* — smaller and less numerous than *P. nigra*. |
| 1—2.4 | *Abies Nordmanniana* var. *leioclada* — only 4—7 m in height, circumference 20—30 cm. |
| r. 1 | *Pirus elaeagrifolia* — single tree on the glade outside the forest. |

Seedlings:

| | |
|---|---|
| r. 1 | *Fagus orientalis* — 20 cm in height. |
| r. 1 | *Pirus elaeagrifolia* — 20 cm in height. |
| | *Salix* sp. |

Shrub stratum:

*Juniperus nana*
*Daphne pontica*

Ground stratum:

| | | | |
|---|---|---|---|
| 2.2—3 | *Rubus tomentosus* var. *canescens* — in the part of forest nearest to subalpine meadows | 1.1 | *Polygala anatolica* |
| 2.2 | *Hieracium* sp. | 1.2 | *Pimpinella Saxifraga* |
| 1—2.2 | *Trifolium armenium* | r. 1—2 | *Dianthus Carthusianorum?* |
| 1—2.2 | *Silene italica?* | r. 1 | *Trifolium rivulare* |
| 1—2.2 | *Pedicularis Wilhelmsiana* | r. 1 | *Cephalaria procera?* |
| 1—2.2 | *Briza* sp. | r. 1 | *Viola* sp. |
| 1—2.2 | *Fragaria vesca* | r. 1 | *Asperula involucrata* |
| 1—2.2 | *Chrysanthemum* sp. | r. 1 | *Stachys lanata* |
| 1.1—2 | *Campanula* sp. | r. 1 | *Gentiana asclepiadea* |
| 1.1—2 | *Geranium asphodeloides* | r. 2 | *Pirola secunda* |
| 1.1—2 | *Geranium pyrenaicum* | r. 1 | *Goodyera repens?* |
| 1.1—2 | *Dactylis* sp. | | *Dorycnium latifolium* |
| | | | *Bromus cappadocicus?* |
| | | | *Lathyrus sericeus* |

***Abietetum Nordmannianae*** on the slope of Büyük-Ilgaz-Dagh. Altitude about 1700 m. Exposure: NE (28. VII.). Narrow flat depression with a stream in the bottom of it. Near the water: *Saxifraga Huetiana* (2.3), *Cirsium hypoleucum* (2—2.3), *Geum rivale* (1.1), *Valeriana alliariaefolia* (3.2—3). The general appearance of fir-trees shows that probably the upper limit of this species is situated not far up. Two species of pines accompany the fir-tree, but quantitative proportions between the two remained unnoticed.

---

Tree stratum:

| | |
|---|---|
| 4.3—5 | *Abies Nordmanniana* var. *leioclada*[1]) — circumference of the larger trees — 170 cm, of the smaller — 80 cm. Hight could not be appreciated on account of the denseness of forest. |
| r. 1 | *Pinus nigra* — circumference about 180 cm. |
| | *Pinus silvestris* |

[1]) In the twigs of the fir-trees have been collected the lichens: *Evernia divaricata*, *Alectoria prolifera* and *Usnea Czeczottiae*.

Seedlings:

r. 1 *Fagus orientalis* — small specimens.
2.1 *Abies Nordmanniana* var. *leioclada*

Undergrowth — absent.

Ground stratum:

| | | | |
|---|---|---|---|
| 3.3 | *Rubus tomentosus* var. *canescens* | 1.2—3 | *Pirola uniflora* |
| 2.3 | *Luzula silvatica* | 1.1—2 | *Pirola chlorantha?* |
| 2—3.2 | *Ranunculus Brutius* | 1.2 | *Poa nemoralis?* |
| 2—3.2 | *Cirsium hypoleucum* | 1.2—3 | *Oxalis acetosella* — on rotting old trunks. |
| 2—3.2—3 | *Sanicula europaea* | 1.1 | *Geranium* sp. |
| 2.2 | *Asperula involucrata* | 1.1 | *Brachypod. sylvaticum?* |
| 2.2—3 | *Geum rivale* | 1.1 | *Epilobium montanum?* |
| 1—2.1 | *Valeriana alliariaefolia* | r—1.1 | *Myosotis sylvestris* |
| 1—2.1 | *Hieracium* sp. | r. 1 | *Primula acaulis?* |
| 1—2.2 | *Pirola secunda* | r—1.1 | *Aspidium Filix mas* |
| 1.1—2 | *Fragaria vesca* | | *Festuca montana* var. *typica* |
| 1.1—2 | *Dentaria bulbifera* | | |

Moss- and lichens stratum:

*Dicranum scoparium*, *Mnium affine*, *Drepanocladus uncinatus*, *Rhytidiadelphus triquetrus*. *Cladonia* sp. (on rotting old trunks).

Beginning with the camping place, the high-road descends the slope of the Ilgaz-Dagh chain in rather abrupt curves, soon reaching the middle course of the Balyk-Deressi, where a small stop was ordered. I shall try to reconstruct the picture of the altitudinal zones thus passed. A probably greater abundance of precipitation is at once noticeable behind the pass, for tall herbs appeared in abundance by the wayside, as for instance *Heracleum paphlagonicum*, *Petasites*, *Valleriana alliariaefolia*, among which *Calystegia silvestris* was seen, and in the forest there were ferns, which were extremely scanty on the southern slope, facing towards the interior of Anatolia. Behind the pass we soon entered a part of forest, probably at one time burnt, for *Epilobium angustifolium* — the true index of forest fires — appeared.

In the pine- and fir forests at 1700 m we already noticed small specimens of *Fagus orientalis* (see p. 74). Gradually as we descended, their number increased until they constituted nearly pure brushwood communities covering the slopes as far down as 1350 m. It was only in the

middle part of this zone, at about 1500 m, that I noticed tree-like specimens of beech, bearing fruits; upwards and downwards this narrow middle zone passed into beech shrub communities intermixed with hazelnut shrubs. As here and there — above the general level of these shrubs — there rose solitary *Abies* and *Pinus* trees, I am at a loss whether to regard these shrub-clad slopes as an independent community, constituting the transition from the coniferous forests to the lower-lying steppes, or as representing pine and fir forests destroyed by the activities of man, with their undergrowth of *Corylus* and *Fagus* devoid of the stratum of trees. As the villages we passed did not strike us either by their number or their dimensions, I am rather inclined to take the shrubs for independent communities, due to the insufficient quantity of precipitation, preventing the development of beech as a tree[1]).

At a height of about 1622 m coniferous forest suddenly ceases. This may be owing to the two villages situated at this height. By the road we noticed *Pirus elaeagrifolia*, wild cherry-trees, with small but delicious fruit, also beech, which at this height has already the form of a shrubby tree (at 1529 m they were abundantly fruiting, notwithstanding their small height). Here and there *Pinus nigra* also occurs.

At 1438 m dense beech brushwoods cover the northern slope, with solitary pines rising above them; the southern are devoid of forests, while on the eastern and western slopes sparse pine-trees are seen.

At 1315 m pine forest covers the slopes facing the south, and other slopes bear beech shrubs (with *Corylus Avellana*). Wild cherries and pears are still seen in great abundance.

On an escarpment near the road *Epilobium Dodonaei* and *Silene compacta* were collected.

At 1232 m in the locality named Kuz-Yahy a three hours stay gave us the opportunity of making a closer acquaintance with the stream bank vegetation.

The valley of Balyk-Su widens here and bears a vegetation of a very mixed character. In the part which during the spring thaws must certainly be inundated, masses of *Salix incana* var. *angustissima* grow, accompanied by miserable looking small pines (not collected but probably belonging to *Pinus armena*). The vegetation, consisting of at least three species of *Umbelliferae*, *Epilobium montanum*, some *Dianthus*,

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[1]) This problem is again discussed in a recent paper by the present author, where the view is advanced that the shrub beech communities of Paphlagonia may represent early stages in the occupation of new grounds by beech (18, p. 51).

and many other species, reminded me by its character of that of ruderal places. Beech shrubs, which here cover the slope facing the north, cease at a certain height, probably being limited by the height of the flood. These shrubs are but 3—4 m in height, grow by several stems from one root, and are asociated with *Corylus Avellana* and *Carpinus*. — At 200 m higher up one still sees *Abies* trees.

At 1148 m, on the southern slope, appear xeromorphic shrub communities, already known from previous excursions. *Berberis crataegina* seems to be their most usual component. No more forests are seen on any of the slopes. We thus entered the upper part of Kastamuni-Tashköprü basin, bearing again steppe vegetation and richly cultivated vast spaces.

The road turns to the left, it does not follow the river flowing northwards. We threw our last sad und thankful glance backwards and noticed a very peaceful landscape of the valley we had passed, with both slopes densely covered with beech shrubs and the massif of Büyük-Ilgaz-Dagh in the background, but no longer imposing seen from this side (Pl. XIX. Phot. 37). On the slopes to the road, left uncultivated, real steppe species appeared.

In view of the approaching darkness and great fatigue I do not remember very well the last part of the way, however I noticed that we ascended again some slightly undulating plains, with small groups or very scanty woods of pines. Kastamuni was reached in total darkness.

**Kastamuni.** This rather important town is situated at about 850 m altitude on both sides of the river Geuk-Irmak. The spontaneous vegetation of the nearest vicinities is composed of steppes, which remind one by their composition of those on the hills around Ankara. I collected on the limestone hills in the proximity of town, at the height of about 900 m: *Centaurea consanguinea*, *Paronychia chionea*, *Scabiosa ucranica*, *Jurinea consanguinea* var. All of them have been collected once, over a hundred years ago, near Kastamuni, by Wiedemann.

**From Kastamuni to Tashköprü and Kuru-Chai.** From Kastamuni a side-excursion was organized, which lasted a week and led at first down the river Geuk-Irmak — as far as Tashköprü and Gömer — and from thence in a northerly direction: to the water parting mountains, lying between the river-system of Geuk-Irmak and the rivulets flowing directly to the Black Sea (see map at end). These were quite unknown botanically. The greater part of the way we went by car, from Tash-

köprü with carts, from the village of Kuru-Chai. and for the remaining 8—10 km — with donkeys.

Very soon after we started from Kastamuni, the automobile got damaged and thanks to this I was able to make some notes on the vegetation of this locality. The road was situated quite near to the stream, which was too wide here to be waded: an abrupt slope, getting more gradual farther from the river, passed to the slightly undulating hilly plains — in this season (29th of July) having a yellowish colour. Here, at the height of 750 m, on the slope facing the west, we were again in the zone of steppes and xeromorphic shrubs. I noticed:

**Steppe-community** with sparse shrubs. Altitude about 750 m. Exposure: W. (29. VII). Soil yellowish clayey.

---

Shrubs:

| | |
|---|---|
| 1—2.2 | *Juniperus Oxycedrus* — 30—50 cm in height. |
| | *Rosa* sp. — about 10 cm in height. |
| | *Rubus* sp. |
| 1—2.2—3 | *Paliurus aculeatus* |
| r. 1 | *Crataegus* sp. about 1 m high. |
| r. 1 | *Pyracantha coccinea?* |

Herbs and grasses:

| | | | |
|---|---|---|---|
| 2.2 | *Globularia trichosantha* | 1.2 | *Scabiosa palaestina* |
| 2.2 | *Andropogon Ischaemum* | 1.1 | *Echinops* sp. |
| 1—2.1 | *Xeranthemum squarrosum* | 1.1 | *Onobrychis hypargyrea?* |
| 1—2.1 | *Hieracium* sp. | 1.1 | *Plantago carinata?* |
| 1—2.2 | *Euphorbia tinctoria?* | r. 1 | *Teucrium polium* |
| 1.2—3 | *Astragalus* sp. | r. 1 | *Centaurea* sp. (stemless and white-flowered) |
| 1.2 | *Asperula* sp. | | |

A solitary medium sized oak was standing near by. It proved to be *Quercus pedunculiflora* C. Koch.

We reached Tashköprü in the twilight. The town was hideously dirty. crowded, and hot. While looking for a "han", we were surrounded by a crowd of curious people, as a result of this one of our revolvers disappeared. After drinking a great quantity of tea out of funny little glasses resembling small vases (very narrow in the middle), we tried in vain to sleep, for the bugs attacked fiercely, notwithstanding the lighted lamp, which was kept alight the whole night to frighten them. At dawn we were only too glad to leave this dirty place.

The landscapes along the Geuk-Irmak river were rather pleasant. Here and there we passed some tumuli. It seems that hemp grows best on the alluvials of this river, for never before had we seen such a great number of hemp plantations.

From Gömer we turned rather abruptly northwards, and the river entered the narrow gorge in a now much more mountainous country, to our surprise choosing this difficult way, instead of following more level and low country to the right and left.

The landscape became more varied. For the first time appeared singly and in groups *Juniperus isophyllos* (a rather stately tree), and shrubs and trees of *Pistacia mutica*. *Quercus* shrubs also began to appear. We descended again, passing through *Tamarix*, *Cotoneaster* and *Paliurus* shrubberies to a depression, the surface of which was covered with white salts, and soon reached the village of Kuru-Chai. — Here looking for means of communication to continue our way took up so much time, that for about 4—5 hour we sat in the garden of a rich Turk, while waiting for donkeys or some other transport animals.

It was the time of harvest and thrashing. In the village the thrashing was in full force, giving one the opportunity of seeing this probably most ancient way of fulfilling it. Some wooden flat kind of sledges, having very sharp pieces of flint underneath, were dragged round and round by a horse, buffalo or mule on the same place on which the corn had already been strewn: to make the sledges heavier, a man or woman or several children were standing in them and by their cries encouraged the animal on.

In the garden I noticed quite a lack of system in planting vegetables and trees. Full-grown, uncut vines twined among the trees, while onions grew among other vegetables all mixed up and strongly overgrown with weeds.

**From Kuru-Chai to Djazoglu.** We followed on donkeys the narrow path along the bottom of the rivulet Kuru-Chai. Its name, which means "the dry river", answered very well its condition then, for but little water was flowing; notwithstanding this the valley had the appearance of being fertile. Fresh traces of a very strong inundation were seen everywhere: in the form of deeply eroded ravines, washed out places in the path, which made our progress more difficult, and higher trees torn out by their roots barred our way. To the height of about 700 metres the vegetation of the valley consisted of dense shrubs of *Ostrya carpinifolia*, *Corylus Avellana* and *Cornus mas*, on the slopes of shrub communi-

ties of oaks. Wild apple-trees, pears, and probably also wild walnut trees were seen in great abundance. Still higher up, above the largest village lying along the middle course of the stream, named Khodja-Vakif, splendid specimens of *Quercus cerris* appeared. These stately trees, with their deeply cut shiny leaves, impressed us greatly. On the slopes, the same species was represented almost exclusively by shrubs. In the village itself we noticed a great number of richly fruiting *Morus*, *Sorbus domestica* and a fine specimen of *Quercus pedunculiflora*.

**Djazoglu** represented a village in statu nascendi. On picturesque gentle slopes of the upper course of the Kuru-Chai (bearing here the name of Chamkeui-Su or Ajukhlu-Chai) and its left-sided affluent Su-Chai, were situated log-houses, by twos and trees, each group belonging to one family. These dividings of one group from another probably facilitates the interior life of each family, allowing the women to remain uncovered. — Being a woman I succeeded in entering one of these houses, because I was called in to cure the eldest son of the family, who was lying ill. I was struck by the cleanliness of the appartement, consisting of a large veranda and a dwelling room, which served at once as a bed- and dining-room (both were situated on the first storey, the basement being used for cattle), but the presence of two wives — one older — with her grown up son, being ill, and the younger wife — just nursing her child at the breast, filled me with dismay.

Probably the place was visited very seldom, and last time very long ago, by foreigners, because my botanical work there was dreadfully disturbed by the curiosity of men, who stayed during whole days in our camp, watching my every movement and — what was still worse — talking so loudly among themselves that it was impossible to collest one's thoughts. When asked to leave our camp in peace, they went away — as it seemed deeply offended — but their curiosity prevailed, and very soon afterwards they returned. What was especially shocking, that notwithstanding the time of harvest, the men behaved in such a way as if every week day was Sunday, leaving the work of harvesting to their wives and buffalos.

The geographical position of Djazoglu and — what is more important — of the water parting mountains, on the slopes of which the village is situated, is marked quite incorrectly on the map of Asia Minor by Kiepert (1 : 400 000). According to our data the distance from Kastamuni to Tashköprü is about 40 km. Kuru-Chai (on the rivulet of the same name) is about 20 km distant from the latter town. Up the same

rivulet, at a distance of about 3 km there lies as large, if not larger, a village Khadji-Vakif. 5 km higher up in the same valley, there is an affluent from the east-north-east. Here, at an altitude of 835—900 m are situated the scattered groups of houses, constituting Djazoglu. It give us a distance of about 12 km in the straight line from the river Geuk-Irmak to Djazoglu. Going up the chief stream, in a north-north-westerly direction, after 4 km we meet again a parting of the stream; both currents embrace the summit of Khadji-Aghach, which unnoticed passes into the ranges connecting it with other summits and coast-ranges of unknown name (on the map of Kiepert they probably correspond to Gök-Bel and Elver-Dagh, situated on two sides of Khadji-Aghach). In this way the watershed is about 17 km distant from the river Geuk-Irmak, and is thus much nearer to the coast than is shown on the map already mentioned[1]).

In Djazoglu we met again with new features in the vegetation: although situated still on the inland side of the coast ranges, it contained already in its vegetation the representatives of Mediterranean Region (as for example *Cistus villosus*). Communities in which they were found occupied, however, only small patches. Thus in the shrubberies along the course of the stream near-by I met with great abundance of *Rubus* (*R. Kupcokianus*, *R. sanctus* f. *orientalis*), *Pyracantha coccinea*, *Ligustrum vulgare*, *Ostrya carpinifolia*, all entwined with *Calystegia sylvestris*, *Tamus communis* and *Clematis Vitalba*. They were accompanied by *Corylus Avellana*, *Pteris aquilina*, *Viburnum* sp., *Quercus cerris*. Higher up the nearest mountain — *Cistus villosus* var. *tauricus* and *Rhus Coriaria* were found.

From our camp (Pl. XIX, Phot. 38) we could already see the first trees of *Pinus nigra* var. *Pallasiana*. On closer study I discovered that the trees occupied only spaces with disturbed vegetation (here by the ancient mining works). Escarpments covered with slags bore besides adult and young pine-trees very scanty vegetation consisting of: *Silene compacta*, *Sideritis libanotica* (in troops), *Salvia Sclarea* and *Trifolium arvense*.

On the same slope, where the slags were absent, rich oak brushwood developed. Being about 3—4 metres in height, it struck me at once

[1]) It seems also that the uppermost right-sided affluent of Hem-Dere is marked about 4 km too far to the south. As to the upper course of the river Soku-Dere, which according to the map of Kiepert ought to cross the territory visited by us, we did not meet with any river bearing this name.

by the presence of several species of oaks. They proved to belong to *Quercus cerris*, *Q. crispata* and *Q. infectoria* ssp. *puberula*. The former displayed such an unusual variety in the forms of leaves, that it might be taken for so many species of oaks, were it not for the similarity of the fruits (see Pl. XXXVIII). More detailed account of the composition of this brushwood is given in the following list:

***Quercetum fruticiformis*** near Djazoglu. Altitude 890—925 m. Exposure: SE—E. (31. VII.) Brushwood with predominance of oaks on the slope of Sellik-Kaya. Soil very shallow on brown chloritic, sericitic, or clay slates, which in places outcrop. About 70% of surface is covered with vegetation (Phot. 38).

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Shrub stratum:

| | |
|---|---|
| 3—4.3 | *Quercus cerris* — 2—4 m high. |
| 2.2 | { *Quercus crispata* — 1½—3 m high. |
| | { *Quercus infectoria* — 1½—3 m high. |
| 1.2—3 | *Rhus Coriaria* — to 3 m in height, on the part of slope facing east-north-east. |
| 1.1 | *Juniperus Oxycedrus*? about 2 m in height. |
| 1.1 | *Cistus laurifolius* — 1 m high (from 950 m up is much abundant). |
| r. 1 | *Crataegus tanacetifolia*? — about ½ m high. |
| r. 1 | *Colutea cilicica*? |
| r. 1 | *Rosa* sp. |
| | *Pistacia palaestina* |

Ground stratum:

| | |
|---|---|
| 1—2.2—3 | *Trifolium arvense* |
| 2.2 | *Sedum pallidum* |
| 2.1—2 | *Alyssum obtusifolium* — in fissure of outcropping rocks. |
| 2.1 | *Salvia gradiflora* |
| 1.2—3 | *Salvia* sp. |
| 1—2.2 | *Cruciancella Graeca* |
| 1.2 | *Teucrium polium* |
| 1—2.2 | *Hieracium Hoppeanum* ssp. *antennarioides* |
| 1—2.1 | *Bromus*? |
| 1.1 | *Poa nemoralis* — chiefly on rocks. |
| 1.1 | *Campanula rapunculoides* |
| 1.1 | *Hedera Helix*? — in tiny specimen difficult to be noticed. |

r. 1 *Trifolium* sp. (yellow-flowered).
r. 1 *Dorycnium latifolium*
1.1 *Sedum album* — in fissures of rocks.
r. 1 *Lathyrus?*
r. 2 *Ceterach officinarum* — in fissures of rocks.
r. 1 *Asplenium Trichomanes* — in fissures of rocks.
r. 1 *Eryngium giganteum*

Further exploration of the same spot showed that on the slope, which from an easterly exposure passed to north-north-east, in the undergrowth of *Pinus nigra* wood, here much denser, and in the oak-shrubs were growing graceful shrubs of *Rhus Coriaria*, much used here for dying purposes (as well as *Cistus laurifolius*, present higher up). From the top of the same mountain (Sellik-Kaya) I was brought a magnificent specimen of *Sempervivum ruthenicum*. At the same height on the slope facing to the south the shrubs and trees desappear and we find a very scanty vegetational carpet, covering but 30% of the surface and consisting chiefly of *Cistus villosus*.

**Excursion to Khadji-Aghach.** A whole day's excursion to the summit of Khadji-Aghach acquainted us with other communities, characteristic of the coast-ranges of this part of Anatolia. The way led first (about 4 km) along the bottom of the Chamkeui-Su (being the upper part of Kuru-Chai) — up to the place where it divided. The slope of this side-valley, facing north, was densely covered by shrubs and small trees of beech, other slopes were occupied by stately pine-forests. That the latter were virgin was indicated by the fact that the dogs (from the dwelling places nearest to our camp) barked throughout the whole night trying to chase the bears which greedily attacked the fields sown with millet.

Only in the lower part of this valley, on the denuded escarpments turned to the south, some of the steppe plants were still met with, as for example *Scutellaria orientalis*. Higher up we were in a full forest region.

Beginning with the fork of the stream we went straight up the slope of Khadji-Aghach and followed its more or less steep slope for a distance of about 4—6 km till its slightly protruding summit was reached, which did not exceed the ranges to the west and east, and was linked with them by slightly lower rigdes. In the lower part we entered a splendid pine-forest, consisting of mast-like specimens of *Pinus nigra* var. *Pallo-*

*siana*. The dense undergrowth consisted of shrubs of *Cistus laurifolius* and sparse small trees of *Quercus cerris* and some arborescent form of *Quercus infectoria* (Pl. XX, Phot. 39). At the height of about 1300 m I could see through the trees the far distant opposite slope of the valley which was situated to the east of Khadji-Aghach. On the slope facing the west the dominant forests were also of *Pinus nigra*, along the ravines and depressions the darker belts marked the presence of *Abies Nordmanniana* var. *leioclada*, which in single individuals was found also among beech shrubs on the slope with north-north-east exposure of Khadji-Aghach. Where we stayed — the forest reached its full development, the diameter of single specimens of *Pinus* being about 1 metre. *Cistus laurifolius* did not reach higher than 1400 m, when solitary small shrubs were still noticed. A little higher came oaks, having the form of 3—4 m high trees. But in their place appeared in greater abundance the representatives of the ground stratum in the form of species: *Euphorbia amygdaloides* (very abundant), *Galium verum*, *Dorycnium latifolium*, *Euphorbia Gerardiana* (very often, from 1400—1750 m). At this altitude was noticed also the first shrubs of *Daphne pontica*. At one place the path leads outside the forest, along the border of cultivated field. Here a huge specimen of oak was noticed, having a circumference of about 6 m, probably *Quercus Delachampii* Ten. Rocks outcropped seldom, and proved to be limestone. Higher up a burnt part of the forest was passed, in which *Pteris aquilina* reached the full development, covering wide tracts. (Other species of fern were quite absent; this is probably accounted for by the comparatively great dryness of the climate on this slope).

At 1520 m — already quite near to the summit — the surface became more level; here a "yaila"[1]) was situated. Among much thinner forest severel log-buildings, serving for shepherds as summer dwelling places, were seen. Large specimens of black cows and buffalos were grazing. Notwithstanding the destruction of the vegetation by cattle, I found still a considerable number of plants. The forest at this place consisted of:

***Pinetum nigrae.*** Grazed pine-forest on the crest of Khadji-Aghach, altitude 1520 m, exposure SE. (1. VIII).

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Tree stratum:

3—4.3 *Pinus nigra* var. *Pallasiana*

[1]) Summer pasture grounds situated on the mountains, generally devoid of forests.

Shrub stratum:

1.1 *Daphne pontica*

Ground stratum:

2.1—2 *Digitalis ferruginea*
2—3.2 *Euphorbia amygdaloides*
r. 1 *Gentiana cruciata*
1.2 *Calamintha grandiflora*
r. 1 *Limonodorum abortivum*
*Polygala anatolica* (from 1400 to 1760 m)
*Hieracium maculatum* var. *Anatoliae*
*Dorycnium latifolium* (at 1600 m).

We followed upwards a very gradually rising ridge. It was devoid of trees along the path, but the view to the right — to the Black Sea was still covered by the trees. They were 5—8 m high pines — *Pinus armena*, which 50—70 m below the summit were replaced by *Pinus nigra*. Among them small specimens of *Abies Nordmanniana* var. *leioclada* appeared, and together with them *Asperula involucrata* (?). Near the path were seen some tall *Verbascum* and *Marrubium* plants, indicating the nearness of herds of cattle. At 1700 m the first subalpine plants appear, they are: *Hypericum alpestre* and *Juniperus nana*. At 1762 m the summit is reached. In the far distance to the right something whitish appeared: we were told it was the sea. The valleys on the northern slope of this coast range — at least at its upper part, seemed to be very steep, deeply eroded and densely wooded. Seemingly the *Abies* forests prevailed (probably passing lower down into beech-forests?). From a botanical point of view it was a terra incognita, not yet visited by any botanist. The summit itself represented a small space devoid of trees, surrounded by miserable looking, densely growing *Pinus armena*, strongly attacked by lichens. The vegetation of the very summit consisted of:

**Subalpine vegetation** on the summit of Khadji-Aghach. Altitude: 1762 m. (1. VIII).

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Shrub stratum:

1—2.1 *Juniperus nana* — about 30 cm in height.

Ground stratum:

3—4.3—4 *Cytisus pygmeus*
2.1—2 *Thymus parviflorus*
1.1 *Polygala anatolica* — fruits
1.2 *Galium verum? G. aureum?*

1—2.2 *Sedum* sp.
1—2.1 *Agrostis* sp.?
1.1 *Hypericum alpestre*
1.1 *Verbascum* sp.
1.1 *Deschampsia flexuosa?*
r. 1 *Viola* sp.
*Alchemilla Grossheimii*

Moss stratum:

3.2—3 *Polytrichum juniperinum*

I returned from this excursion rather disappointed: the beech forests, which I had expected to find here and to be able to compare them with those seen in Bithynia — were absent, beech being present only in a shrub form. Perhaps the northern slopes of the coast ranges bear them in the lower zone.

We returned hurriedly back. — It was noticed, that in the bottom of the valley no specimen of *Platanus orientalis* was met with. Instead — large trees of *Juglans regia* (wild ?) and small trees of *Crataegus tanacetifolia* were found.

Here, as in the former camping places, I made some meteorological observations, which gave me the following data:

| Locality and altitude | Time of day | morning | | afternoon | | evening | |
|---|---|---|---|---|---|---|---|
| | Date | hour | temperature C | h | t | h | t |
| Djazoglu ca. 835 m | 30. VII | — | — | — | — | *22.30* | 14° |
| | 31. VII | *8* | 15° | — | — | *21.50* | 17.5° |
| | 1. VIII | *7.30* | 12.8° | — | — | *24.00* | 16.5° |
| | 2. VIII | — | — | — | — | *21.30* | 18° |
| | 3. VIII | *7* | 15.6° | — | — | (see Kastamuni) | |
| | | Medium: | 14.3° | — | — | — | 16.5° |

The comparison of these data with those obtained in Kastamuni (see below) is not devoid of interest.

**From Djazoglu to Kastamuni.** We returned back by the same path and road, partly on foot, partly in carts and on the final space (from Sirkeli to Kastamuni) in an automobile.

For Kastamuni my measurements gave the altitude of about 850 m and temperatures:

| Locality and altitude | Time of day | morning | | afternoon | | evening | |
|---|---|---|---|---|---|---|---|
| | Date | hour | temperature C | h | t | h | t |
| Kastamuni ca. 850 m | 3. VIII | — | — | — | — | *22.40* | 21.5° |
| | 4. VIII | *8.15* | 25.2° | — | — | (see Edjevid) | |

It is obvious that the more interior position — among the steppe hills, although almost at the same altitude as Djazoglu (situated in the mountains), results in much higher morning and evening temperatures.

**From Kastamuni to Edjevid.** To reach the sea-coast we were obliged to pass several ranges, which — to distinguish them from the mountain chains situated to the south of Kastamuni-Tashköprü-Boyabad basin (depression) — we shall call coast ranges. A stay of 2—3 days in Edjevid was planned, to get a little rest after our very intensive work of the last four weeks. The road from Kastamuni to Ineboli is a well kept highway, on which automobiles are most used. Not having much time, we were obliged also to make use of this kind of transport, which was, however, unfortunate for my botanical observations. Fortunately for me, from time to time the larger automobile, loaded with our luggage, broke down and while it was being repeared I was able to collect some plants and make notes.

The road has at first a north-north-west direction. The chief river flowing along the west-east depression, Dadai-Chai, had to be crossed. During one of the unexpected stops I noticed with surprise that a dried up steppe near the road was literally strewn with several kinds of shells of land-snails[1]). Soon we entered the valley of the tributary of Dadai-Chai — Uzun-Dere. Solitary *Crataegus*, small trees and here and there sparse shrubs of *Juniperus* (*J. Oxycedrus*?) could not diversify very much the monotonous landscape. Soon the valley became narrower and the slopes more abrupt. At 1040 m — on the western slope — thin pine wood first appeared, opposite to this, on the eastern slope, was an oak-grove (probably planted?), in which the grave of a "saint" was said to be situated. The road began to rise and the rivulet became farther

[1]) Some of them have been collected and are now being studied by a specialist.

and farther below us. On the slopes with the northern exposure, at the height of 1220 m suddenly there appeared a dense shrubbery of oaks (not collected!) accompanied by *Cistus laurifolius*. Gradually — when approaching the pass — the shrubs became lower and lower, having at 1297 m a height of only 10 cm and disappearing completely at 1327 m. Flat limestone hills, only partly covered with grasses and herbs, extended everywhere. Herds of sheep were seen. The pass was reached at 1374 m (according to Lebling, 41, p. 110, at 1200 m).

The road, which leads before the Dadai-Chai through the Neogene plates and behind this river — among red conglomerates (Lebling, l. c. p. 110), follows up the Uzun-Kave (a "han") the Paleozoic phyllites, which change higher up into nummulitic limestones (of Eocene age?). Behind the pass the phyllites are covered by thin plates of nummulitic limestones and red conglomerates. The way now descends to another depression, which according to Lebling "ist nach Alter und Form als Ova zu bezeichnen" and is filled by the folded hills of the Eocene limestone and clay. This geological region has its northern limit on the line: Manjilik-Anvar (Lebling, l. c. p. 111), where again old deposits (slates, graywackes, limestones) appear[1]).

Botanically — straight behind the pass a much richer vegetation appears (*Morina persica*, *Galega officinalis*?, *Ononis* sp.). To the left are seen two small groves consisting of thin miserable pine trees (probably *P. armena*). The depression before us is occupied by Devrikian-Chai, its lowest part having only 950 m altitude. The village of Seidler (1114 m) occupies the slope of a very strange looking rounded rocky hill, having a pillow-structure[2]).

When our automobile ascended this hill by many spirals, total darkness had fallen. Soon the next pass was reached, having according to us 1404 m altitude, Leonhard, however, gives only 1270 m (Lebling repeats the same). This is the crest of a phyllitic range and, according to Lebling, the sparse steppe vegetation reaches as far as this place. "10 m weiter setzt mit einem Schlag die echte pontische Flora ein"

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[1]) That is: the peneplain has the same geological structure before Seidler as after it, which proves that: "Es handelt sich um ein und dieselbe Masse, die durch eine Senke mit Eozänerfüllung zweigeteilt ist" (Lebling, 41, p. 110).

[2]) Leonhard, who followed the same road in the opposite direction to this place, turned along the Devrikian-Chai to the west. He also draws attention to the immense quantities of shells of land-snails, the elongated ones being *Buliminus Narcinei* Galand, the rounded — *Cerophylla Krynickii* Andr. (42, p. 91).

(l. c. p. 111). We could not see it, but notwithstanding the total darkness, we felt this sudden change in the humid freshness of the air, in the noise of rushing streams, in the smell of needles of coniferous forests and the breeze through the trees. (But it seems that pine-woods, fir-trees and rich oak-vegetation appeared already before the pass through Chatal Tepe — the name of this mountain). — A little before midnight the huge "han" in Edjevid was reached — our resting place for the next three days.

**Edjevid.** Sintenis botanized in Edjevid. I am under the impression that this is the name of the locality, but not of a village, for I do not remember having seen one. The huge dimensions of the "han" is explained by the place being considered very healthy and a summer ressort of the richer families from Kastamuni.

The landscape is not imposing but very agreeable. Although we were here at 1170 m, the vicinities did not seem mountainous but rather hilly. We started across the road and fertile fields to the nearest woods, situated on the other side of the rivulet (Üzünös-Deressi). On the uncultivated strips between the fields very beautiful specimens of *Scabiosa procera* were met with, on the outskirts of the forest, changed in many places by destruction into groves, *Helleborus Kochii* — now fruiting — grew in abundance. My attention was drawn to the trees growing on the balks: they were mostly wild fruit trees (plums, pears), but among them some interesting oaks occurred, which proved afterwards to belong to *Quercus Bornmülleriana* Schwrz.

The forests which we entered, occupying the hilly country, showed, according to the exposure of slope which they covered, a great variety in composition. They did not strike one either by the dimensions of the trees — which were only of a medium size — or the thickness of the undergrowth, or the richness of the ground stratum. No, they struck us by the presence of new elements, not met with until now on our way from Central Anatolia, by a new combination of species, giving a well developed association (may be more than one!), of a very interesting composition.

All floristical particulars being found in the lists given below, I shall lay stress only on the general features: these forests displayed great variety in their composition, many species of trees taking part in them. We never saw before or afterwards such a quantity of *Sorbus torminalis*. Again, the simultaneous presence of pine-trees (*Pinus hamata* and *P. armena*) in the upper stratum and *Azalea pontica* in the

ower one was very attractive[1]). *Melampyrum arvense*, with its reddish flowers, was noticed growing in great abundance. On the slopes facing east and north-east *Azalea* was quite absent, on the other hand — two species of shrub oaks — one with yellowish elongated smaller leaves, another — with greenish longer leaves, displayed their best development just there (see Pl. XXXVII). On the outskirt of the forest were growing several well developed oak-trees, bearing — as it seemed — more acorns than leaves. They proved afterwards to be *Quercus Hartwissiana* Stev., the known western limit of which was thus extended in a westerly direction many hundreds kilometres.

***Pineto-Abietetum.*** Mixed forest on the hills to the east from Edjevid. Altitude: 1112 m. Exposure: W. (6. VIII).

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Tree stratum:

3.2 { *Pinus hamata* / *Pinus silvestris* } — both about 8 m in height.
2—3.2 *Abies Nordmanniana* var. *leioclada* — about 12 m high.
2.1 *Carpinus Betulus*
1.2 *Sorbus torminalis*
1.1 *Populus tremula*
1.1 *Prunus* sp.

Seedlings:

1—2.1 *Fagus orientalis*
1—2.1 *Carpinus Betulus*

Shrub stratum:

3—4.4 *Azalea pontica*
3.1 *Quercus colchica* — about 1 1/2 m high.
1.1 *Quercus polycarpa* — 2—3 m in height.

Ground stratum:

1.2 *Melampyrum arvense* var. *elatius*
1.2 *Hieracium* sp.
1.1 *Digitalis ferruginea*
1.1 *Gramineae*
*Veronica* sp.

[1]) It is interesting to note that in the relict partial area in Poland and White Russia, where *Azalea* is cut off from its continuous area by hundreds of kilometres, it is to be found also as an associate of the pine, being found chiefly in pine-woods.

Moss and lichenes stratum: Mosses occupy about $^1/_3$, lichens — about $^1/_{10}$ of the surface, the remaining part is covered with the fallen needles.

*Dicranum Scoparium* var. *polycarpum*
*Pleurozium Schreberi*

***Pinetum quercosum.*** Low forest on the hills to the east from Edjevid. Altitude: 1172 m. Exposure: SW. (6. VIII). Landscape represents gentle hills more or less densely wooded, leaving, however, here and there open spaces overgrown with short but rather fresh sward. At the border of forest several stately *Quercus Hartwissiana* were growing.

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Tree stratum:

3.2 { *Pinus silvestris* / *Pinus hamata* } 8—10 m high.

Seedlings:

r. 1 *Abies Nordmanniana* var. *leioclada* — about ½ m in height.

Shrub stratum:

2—3.2 *Cistus laurifolius*
2—3.2 *Quercus colchica* — large shrubs about 1½ m in height.
1.1 *Quercus polycarpa* — about 2 m high.

Ground stratum:

1—2.1 *Melampyrum arvense* var. *elatius*
r. 1 *Luzula* sp.
*Dorycnium latifolium*

Mosses and lichenes — absent.

The same locality. Altitude: 1172 m. Exposure: NE.

Tree stratum:

*Pinus silvestris* / *P. hamata* / *P. armena?* — only several metres in height.
*Abies Nordmanniana* var. *leioclada* — about 10 m high.

Seedlings:

*Carpinus Betulus*
*Fagus orientalis*
*Populus tremula*

Shrub stratum:

*Quercus colchica*
*Quercus polycarpa*

Ground stratum:

*Dorycnium latifolium?* — sparse.
*Gramineae* — sparse.

Mosses occupy only $^1/_5$ of the surface. Needles, cones and fallen leaves cover the remaining part.

Among the same hills, in a depression having a south-north trend and sheltered from all sides, oak shrubs densely cover the slopes (*Quercus polycarpa* abund. 2—3, soc. 3; *Quercus colchica* with the degree of abundance 2—3, and soc. 2; pines — probably *Pinus silvestris* — are scarce, and only 10 m in height).

**From Edjevid to Küre.** Wishing to visit the town of Küre, situated but a few kilometres to the north on the way to Ineboli, we descended by automobile the numerous windings of the road down the slope of the limestone mountain massif of Kush-Dagh (see map at end). A special excursion of several hours was arranged for this, on the same day, on our way back to Edjevid.

Soon the Black Sea appeared: contrary to its name, like something brilliant and white, much lighter than the sky, like something much dreamt of and expected.

The sea was separated from us by an imposing range, with sharp outlines. In the distance, quite hidden in the bottom of the valley of Üsünos-Dere, Küre was seen (Pl. XX, Phot. 40). It looked very fresh, on account of having lately been rebuilt after a big fire. The slopes of the valley were mostly wooded (fir predominating), save for the lowermost part, probably devastated by man. Also the slopes facing south seemed bare.

Starting from the town to the slope of the nearest mountain, bearing higher up, as it seemed, a monastery, and in the lower portion — the traces of mining works, we were struck by the presence again of the same communities, which were met with near Edjevid; here they were in a much destroyed state. The old mining works probably accounted for the deforestation, but the original communities were quickly re-appearing.

According to our measurement the town of Küre is situated at 963 m (on Kiepert's map — 935 m). While the crest of Kush-Dagh and of the range which separated us from the sea consisted of limestones (of Lower Cretaceous age — Lebling, l. c. p. 112), in the valley are to be found gabbro, peridotites, dioriritic tuffs, limeslates and sandstones. "It seems to be a probable supposition, that the peridotites and gabbro constitute the basis, which is overlain by sandstones and slates, while fine-grained diorits and their tuffs are intrusive and cover both the former rocks" — this quotation, taken from the unpublished report of Prof. Nikitin, concerns the mountain nearest the town. This mountain contains copper deposits, the exploitation of which was long since relinquished.

When climbing the eastern slope of this "monastery" mountain, we met at first a great number of small pines obviously belonging to two species: one in the form of tiny trees (fruiting specimens being only 25 cm high!) and short but spreading shrubs — which proved to belong to *Pinus armena* Koch. var. *parvifolia* Fomin, a species which plays the same part in the flora of Transcaucasia and Northern Asia Minor as *Pinus montana* Mill. in our European flora, for it also is limited to the subalpine and alpine zones; the other pine present here was *Pinus nigra* var. *Pallasiana* — in the form of strong shrubs and small trees. They were accompanied by a most interesting list of shrubs, not all met with together, but with local prevalence of one or another species. In the lower part of the slope grew here and there *Juniperus nana* (!), higher up we entered dense shrubberies consisting of *Cistus laurifolius* and *Azalea pontica* (at 1170 m), the latter fruiting abundantly; in the ground stratum *Dorycnium latifolium* and *D. intermedium* were noticed. The vegetation, which I found in a flat ravine eroded on the same slope was much less destroyed. Here, at an altitude of 1258 m, several trees of *Abies Nordmanniana* var. *leioclada* were met with. More abundant was *Populus tremula* with which were intermixed: *Carpinus Betulus*, *Pinus nigra*, *Acer platanoides* — all of them in the form of small trees. There again the undergrowth consisted of: *Crataegus monogyna*, *Mespilus germanica*, *Vaccinium Arctostaphylos* loaded with tasty fruits, with the leaves which under the influence of cool nights (5. VIII) had become quite red, and splendid huge shrubs of white flowering *Rubus discolor*; in the ground stratum were noticed *Pirola minor* and *Pirola secunda*, some *Avena* and *Deschampsia* and *Dorycnium latifolium*. On the verge of the ravine appeared also two species of oak, known already from the pine forest from near Edjevid. It was obvious that we had to do

with the fragments of the same association, which could not develop on account of the activities of man, who probably did not allow the trees even to reach their full age (I could not see any cut stumps). Behind the ravine *Quercus polycarpa*, with its green hanging leaves, and *Quercus colchica* were decidedly dominant, excluding all other shrubs. The latter is easily distinguished from the former by the erect leaves which are yellowish in colour (see Pl. XXXVII). The former formed stately shrubs $2\frac{1}{2}$—3 m in height, the latter was much smaller. In the north-easterly direction — as far as I could see — the whole slope was occupied by this oak-community.

**Kush-Tepe.** After visiting this slope, my husband and I took the way back with the purpose of exploring the forests of the northern slope of Kush-Tepe, which looked from far very tempting and undestroyed. We followed the northern slope beginning with the spot, where a small stream crosses the high-road, at about 1210 m and climbed to the altitude of about 1460 m. The usual want of time prevented the further ascent.

On nearer acquaintance the forest covering of the Kush-Tepe proved to be very destroyed: the ominous sounds of sawing were heard. When we approached the spot, to our astonishment, not men but women were busy with the heavy work of sawing. Besides this the destruction of forest was contributed to by using it as pasture ground. Owing probably to these two causes the trees seemed to be of not greater age than 30—40 years (except *Taxus baccata*). And yet it was probably an unusually favourable spot for the development of forest, for it struggled vigorously against destruction, creating in places quite inaccessible thickets, where we felt completely entangled by the exuberance of the growth of trees, shrubs, creepers, and herbs.

The list given below shows the unusually great number of species taking part in the composition of this forest. The quantity of species of shrubs is particularly striking, considering that the list was obtained by a single record. If supplemented by observations made on a wider space of the same slope or on neighbouring slopes, it would probably display an even greater number of species.

**Mixed forest (*Fageto-Abietetum*)**, on the slope of the limestone mountain — Kusz-Tepe. Altitude 1372—1460 m. Exposure: N. (5.VIII). Notwithstanding great destruction by felling, in places the trees and shrubs are impenetrable. Judging by the height and thickness of the

trees, the forest is 30—40 years old. Only the presence of rather thick yew trees speaks for the much greater age of the whole community[1]).

Tree stratum:

2—3.2 *Abies Nordmanniana* var. *leioclada* — about 15 m high.
1—2.1 *Taxus baccata* — most of them are but 1 m in height, only once a tree 4 m high was met with.
1—2.2 *Carpinus Betulus*
3—4.3 *Fagus orientalis* — locally abundant; trees, having in circumference about 120 cm, begin but at 1400 m; lower beech is to be met with only in the form of shrubs.
r. 2 *Fraxinus excelsior*
r. 1 *Quercus Bornmülleriana*
1.1 *Acer campestre*
1.1 *Acer platanoides*
r. 1 *Acer Pseudoplatanus*
r. 1 *Sorbus torminalis*

Shrub stratum:

3.3 *Corylus Avellana*
2.1 *Rubus discolor* — vulgar.
1.2 *Ligustrum vulgare*
1.2 *Pyracantha coccinea*
1.2 *Daphne pontica*
r. 1 *Evonymus latifolia*
r. 1 *Viburnum Opulus*
r. 1 *Crataegus monogyna*
r. 1 *Sorbus graeca*
r. 1 *Rosa canina* var. *andegavensis* — on the outskirt of the forest.
*Mespilus germanica*
*Viburnum Lantana*
*Rubus Linkianus* — on the outskirt of the forest.

Stratum of tall ferns, grasses and herbs:

1—2.2 { *Aspidium Filix mas*
*Aspidium Filix mas* var. *longilobum*
*Aspidium lobatum*
*Aspidium aculeatum* var. *vulgare*
*Athyrium Filix femina* var. *fissidens* }

[1]) I do not feel quite certain whether in this case we are dealing with one, two, or even more associations.

1—2.1 *Cirsium hypoleucum*
1.2 *Brachypodium silvaticum*
1.1 *Melica uniflora*
1.2 *Festuca* sp.
1.2 *Geranium asphodeloides*
1.2 *Bromus asper*
1.1 *Valeriana alliariaefolia*
r. 2 *Lilium Martagon*
r. 1 *Campanula latifolia*
r. 2—3 *Saxifraga rotundifolia* f. *vulgaris* — on limestone rocks in the pure beech society.
*Polygonatum polyanthemum*

Stratum of lower ferns, grasses and herbs:

2.2 *Asperula odorata* — on limestone rocks in the pure beech society.
1.1 *Euphorbia amygdaloides*
1.2—3 *Trachystemon orientale* — bound to the beech society.
1.2 *Dentaria bulbifera*
r. 2 *Scolopendrium officinale* — in clefts of limestone rocks, in the pure beech society.
1.1 *Melica uniflora*
1.1 *Gentiana asclepiadea*
r. 3 *Sedum stoloniferum* — gregariously in a glade.
1.2—3 *Epilobium* sp. — gregariously in a glade.
r. 1 *Aristolochia pontica*
*Calamintha grandiflora*
*Polypodium vulgare* — in fissures of limestone rocks, in pure beech society.
*Viola* sp.
*Cardamine impatiens*

Mosses:

r. 3 *Neckera mediterranea* — on limestone rocks in pure beech society.

Creepers:

2.2 *Rubus hirtus* var. *hercynicus*
1.1 *Tamus communis*
*Clematis Vitalba*
*Hedera colchica*

*Taxus baccata*, not met with before, occurred here in great abundance. At the altitude of about 1370 m beech appeared in greater quantity, whereas till this altitude hornbeam seemed to prevail. It was mostly in shrub form, becoming a tree higher up. In places the forest consisted nearly of a pure stand of *Abies Nordmanniana* var. *leioclada*, which being branched down to the ground, compelled those who did not wish to go round them to creep on the ground. Higher up, at about 1460 m, where the limestone rocks outcropped, we found a fragment of pure beech forest, which was very attractive: under short but strong abundantly fruiting beeches (having to 420 cm in circumference) humid rocks were covered with a rich moss carpet (*Neckera mediterranea*), in which were strewn innumerable specimens of *Saxifraga rotundifolia* f. *vulgaris*. *Scolopendrium officinale*, *Polypodium vulgare*, *Hedera colchica* and *Asperula odorata* were also present, testifying to the great dampness of the air. It is to be noticed that *Azalea pontica* was totally absent on this northern slope. Obviously this species avoids shady forests, requiring, however, a considerable degree of dampness of the air (the slopes looking to the south, near Edjevid, were probably too dry for it). Light pine- and oak-forests, brushwood of the type described from near Küre and — as we shall see below — pseudomacchie are probably places of abode where it develops the best. Another related species — *Rhododendron ponticum* — was not found here either, but it appeared lower down and on the northern slope of the ridge parting Küre from the sea.

**From Edjevid to Ineboli.** Two days later — on the 7th of August — we hurried by automobile along the same high-road, hoping in two hours to reach Ineboli. The so-called "camion" — another car loaded with luggage — which kept us waiting so many times on our previous travel from Kastamuni to Edjevid, was sent beforehand. To our surprise, hardly was Küre passed, when we saw it in the middle of the road, with our Murat sitting on the heap of luggage and quietly eating pears, and two Turks lying in the dust under it, trying to repair some damage. A wheel had to be taken off and replaced. Again a delay. We were at the level of the rivulet of Üsünos-Deressi. Stately *Alnus glutinosa* stood at the water's edge. Both steep slopes — to the right and to the left — were devoid of forest (at least in their lower portion). On the former — nearer to us — I recognised again the same two shrub-oaks (*Quercus polycarpa* and *Q. colchica*) which I had seen near Edjevid and Küre; they constituted here pure brushwoods.

The lowermost part of the road is situated at the place, where Üsünös-Deressi falls into a much larger river — the Alma-Dere. The altitude of this place is about 700 m (according to Lebling — only 540 m). A solid bridge is built over the river, testifying to the strong floods, to which this river is probably subject. From the bridge a splendid panorama opens before the eyes of the traveller (Pl. XXI. Phot. 41). The wild ridge[1]), barring the way to the Black Sea, could compete in its picturesqueness with many a famous mountain landscape of Europe. The conciousness, that it has remained till the present day almost unknown and untrodden by tourists adds to its charm. And what a world of new discoveries awaits the botanist who could leave the high road and plunge into the forests of the lower course of Alma-Dere, not yet visited by any naturalist! I presume that many of the so-called Colchic species, known till now only from Colchis or Talysh, await their discoverer in Asia Minor, being hidden in the deep inaccessible shady ravines which abound in Northern Anatolia (representing the extention to the west of the Colchic forest region). — Such were my thoughts, while I tried to do my best in the few minutes allowed me for collecting plants. The forest near the bridge abounded in fruiting *Sorbus torminalis* and high specimens of *Ostrya carpinifolia*. *Fagus orientalis*, *Carpinus Betulus*, *Corylus Avellana* and some *Pinus* were intermixed with them. Nearer to the stream *Prunus Laurocerasus* was present. Somewhere between Küre and the bridge a change in the vegetation occurs, coniferous forests, which till now had prevailed, giving place to broad-leaved ones. Yet *Abies* and *Pinus* in single specimens are present throughout the whole way to the sea. *Rhododendron ponticum* was noticed for the first time at 900 m. *Azalea pontica* accompanied us the whole time; one could notice how differently these two species behave: while *Rhododendron* seeks shady cool places under the beech, mostly occupying northern slopes, *Azalea* keeps company with oaks (in tree and shrub form) — mostly on the slopes with the eastern and southern exposure.

The pass is reached at about 1130 m. Geologically the range is constituted of limestones, slates, conglomerates, granites and quartzites; behind the pass — again quartzites, slates, locally diabases and red marls are met with (Lebling 41, p. 113). Nearer to the sea flysch-marls appear (of the Upper Cretaceous age?); the exceedingly steep slopes to Ineboli are built of them.

The extensive view which opened before us allowed stating once more the decided prevalence of beech over *Abies*, which yet persisted

[1]) Again of Lower Cretaceous limestones.

here and there as a solitary tree. Beeches were mostly in shrub form. which in this case surely resulted from the premature destruction of the beech forest, for — on the one hand — solitary stately beeches, richly fruiting, were seen growing at the road side, while on the other hand at 910 m appeared *Castanea vesca* (as an intermixture to beech forest) in form of full grown stately trees, which were probably saved from destruction thanks to their fruits. *Hypericum calycinum*, not seen since our travels in Bithynia, appeared nearly at this altitude. Unfortunately I had not the possibility of stopping to study the oak forests (with the dense undergrowth of *Azalea*), which were passed in the same zone. Therefore with still greater attention I collected the leaves and acorns of a solitary huge oak, which we happened to pass on our way at 910 m. Yet even now I cannot define, what precise species it represents (*Quercus Delachampii* Ten.?). I can state only that the huge oak that we met with during our excursion to the summit of Khadji-Aghach belonged exactly to the same species. As the latter place was situated also on the coastal ridge in view of the sea, and about 50—70 km distant from our present locality, the conclusion can be made, that we have to do with a constant form peculiar to the coastal ridges of the central part of Northern Anatolia.

Probably the wide tracts of subalpine meadows originated as the result of the destruction of forest. We met them at this altitude (900 m). Among many kinds of grasses and herbs I noticed with surprise some large flowering *Chrysanthemum*, which we never expected to find in Asia Minor (Boissier does not mention any). Afterwards I learned that Sintenis also collected it between Küre and Ineboli, and that it could not be matched with any known *Chrysanthemum* (see list of plants).

At the same altitude of 900 m on the slopes having a south-southwest exposure, a very beautifully developed pseudomacchia was already present. It consisted of inextricably dense brushwood of the height of a man, in which I distinguished: *Quercus polycarpa*, other shrub oaks (*Q. infectoria* × *polycarpa*), *Arbutus Unedo*, *Erica verticillata*, *Azalea pontica*, *Prunus avium*, *Pteris aquilina*, all entwined with creepers (*Tamus* appeared already before the bridge).

Only several kilometres parted us from the sea. The road ran along a crest between two valleys. We descended in many windings. It seems that at the altitude of about 700 m the beech woods ceased. At 540 m the true representatives of the Mediterranean flora appeared in the form of *Spartium junceum*, covering a denuded steep wall with western

exposure. At 330 m first *Ficus Carica* was seen. The cultivation of corn must have played quite an inferior part here, for all spaces were occupied by fruiting trees and vegetables. Pear-trees and peach-trees were overloaded with fruit and water-melons were sold along the road at fabulously low prices.

**Ineboli** (Pl. XXI. Phot. 42). This town would be of much greater importance, owing to its connection with the capital — Ankara, were it not for the lack of a good harbour. A small pier built as it seems not long ago, serves as a shelter only for very small vessels. All larger steamers stop at a distance of 2—3 km from the shore and the goods and passengers are transported in small boats. When the sea is rough — which on the Black Sea happens very often — the steamers stop only to take the mail and no passengers are allowed to embark. As at the time we reached Ineboli a strong gale was blowing, we were obliged to wait three days until the huge waves threatening to destroy the pier became calmed (Pl. XXII, Phot. 43). We were too tired to undertake any long excursions in the vicinity and followed with a longing eye the passing by of the steamers (Pl. XXII, Phot. 44). In vain we tried to pierce the foggy spaces to see the coasts of the Crimea, famous for its beauty. Yet in the days when the air is especially transparent, the inhabitants told us it can be seen, notwithstanding the distance of about 270 km.

Ineboli is situated at the outlet of a small insignificant rivulet, which being barren by shingle and sand (not forming here any dunes) ends in a pool, communicating during heavy sea with the salt water of the Black Sea. Notwithstanding the brackish water thus obtained, frogs inhabit this pool in great numbers and their croaking in the evenings, so very near to the sea, forms a strange disharmony with the roaring of the waves.

The Black Sea shore here represents a beach, soon ending to the east, where a steep slope leaves no space for forming a beach, and stretching for several kilometres to the west, where it probably ends near the rocky promontories seen in the distance (Pl. XXII. Phot. 44). My husband and I followed the beach in the westerly direction for about 3 km and were tired by the monotony of the composition of its very open vegetation. Only in the part farthest from the sea the soil consisted of sand; nearer to the water the sand passed into gravel and a very wide strip was occupied by pebbles and boulders. Only the sandy and gravelly part bore any vegetation; it was chiefly composed of *Eryngium*

*maritimum*, *Glaucium luteum* and *Scolymus hispanicus*. Certainly there were more species, but they remained unnoticed because my attention was drawn by the vegetation, which was found on the slope adjacent to the beach.

This slope, beginning with a scarp of 1—2 metres in height, was covered partly by fields of wheat (now — on the 8th of August — already long ago mown), but more often by plantations of maize and vegetables. Still the vegetation of the scarp near the beach, and along the paths which crossed the slope and strips which remained uncultivated, allowed one to guess what the original vegetation of this slope was. In the immediate vicinity to the beach we found shrubberies consisting of *Myrtus communis*, *Laurus nobilis* and *Phillyrea media*. Above them rose solitary high shrubs and small trees of *Pinus nigra* var. *Pallasiana* and *Abies Nordmannian* var. *leioclada*. It was a surprise to find the characteristic type of forests of the montane zone — the fir — at the level of the sea!

The next day, while awaiting for the sea to grow calm, we made a small excursion up the slope in a south-easterly direction, which slope was dotted in a picturesque manner with small houses and gardens belonging to the richer Greek population. On uncultivated narrow strips among the fields again appeared dense shrubs of *Laurus nobilis* (used here even for quickset hedges), huge shrubs of some *Rubus*, overloaded with fruits and entwined with *Calystegia silvestris*, *Arbutus Unedo*, *Phytolacca decandra*, *Ficus Carica*, *Siler trilobum* and some other *Umbelliferae*. This was the picture at 100 m altitude. Higher up, where the slope became less steep, we noticed — in more sheltered positions — *Diospyros Lotus* (probably planted), *Cupressus pyramidalis* and *Olea europaea* (the latter very scarce on account of this whole slope being exposed to the northern winds). Higher up, at about 150 m, a small wood was reached. Its composition was very varied. *Ostrya carpinifolia*, *Quercus* sp., *Cornus mas*, with plenty of tasty fruits, *Pinus nigra* (?) constituted the upper layer, *Corylus Avellana* and *Crataegus* sp. — the undergrowth, which was so dense, that the interior part of the wood was with difficulty accessible. In the ground stratum many grasses were seen. On the outskirts of this wood stately shrubs of *Arbutus Unedo* grew. Neither *Rhododendron ponticum* nor *Azalea pontica* (*Rhododendron flavum*) were present. Also no sign of beech was noticed.

It was evident that the original vegetation of this slope represented, at the lower altitude, *Laurus-Myrtus* macchie, which, as we shall see, remained undisturbed in the vicinities of Zunguldak, in the upper part.

at about 150 m, woods, which were mostly constituted by small trees (*Ostrya*, *Cornus*), with the undergrowth constisting partly of the elements of macchie (*Arbutus*), partly — of forest species (*Corylus*). Macchie of *Arbutus*, *Laurus* and *Erica* (*Myrtus* is probably present in the lowermost part) merged upwards into brushwoods, conserving at the altitude of 900 m no more *Laurus*, but consisting chiefly of shrub-oaks (with deciduous leaves?), *Arbutus*, *Erica* and *Azalea pontica*. These submediterranean shrub communities probably do not deserve the name of macchie.

It was only on the 10th of August that we embarked. After some hesitation the captain of an Italian freight steamer accepted a few passengers, ourselves amongst the number; but it was not an easy thing to reach the steamer, for the sea would not calm its turbulent waves, and we were obliged to catch the moment when our boat was upheaved by a wave and then to spring on the steps. The weather was misty. We sailed rather near the shore, which was extremely steep, abrupt, straight-lined and almost devoid of gulfs and coves. Only at the outlet of rivulets the wall of inaccessible coast-cliffs was breaking off, opening up vistas of the interior valleys[1]).

**Zunguldak.** The next day (August 11) a stop of several hours was made in the harbour of Zunguldak, which, time was used by those of our party who were geologists or mining engineers for visiting the famous coal mines, then in full work, by others — Murat and myself — for climbing the limestone hills (of Cretaceous age), nearest to the sea and town, quite overgrown with brushwood communities. — Here only Ali-Riza-Bey and Palibine have botanized (2, p. 15—26).

We at once entered beautiful dense thickets constituted by *Myrtus communis*, *Laurus nobilis* and *Phillyrea media*, the first just being in full blossom, the last — abundantly fruiting (see record below). The presence of a well-developed macchia near Zunguldak is explained by the general trend of the coast — from the south-west to the north-east — and the existence of a small gulf sheltering the vegetation from the obnoxious influence of the northern winds.

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[1]) The description of the character of this coast given by Lebling (40 p. 92) clearly indicates the relative youth of its morphological forms, which fact testifies to the origin of the Black Sea (or at least its southern part) as being created by the breaking and foundaring of coastal land masses. (More on this subject is to be found in the present author's paper, where the problem of Pontis is discussed.)

***Myrteto-Lauretum*** near Zunguldak (Bithynia). Altitude about 76 m. Exposure W. (11.VIII). Well developed macchia on the limestone-rocks covered by a layer of clay, in the immediate proximity to the sea.

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3—4.3 *Laurus nobilis* — to $2^1/_2$ m high.
2—3.1 *Myrtus communis* — about $1^1/_2$ m in height, in full blossom.
1—2.1 *Phillyrea media* — abundantly fruiting.
1—2.1 *Erica arborea* — about $1^1/_2$ m high.
r. 1 *Crataegus* sp.

When we began to descend the opposite slope, facing the east, of the same row of cliffs nearest to the sea, I could observe the abrupt change in the vegetation caused by the difference in the exposure: it was almost totally lacking in any true macchia components (scanty small shrubs of *Arbutus Unedo*), and consisted of oak shrubs, belonging to the species with the deciduous leaves (*Quercus polycarpa* and *Q. colchica*), and having the height of about $1^1/_2$ metre. It continued to the bottom of the flat depression which parted the coastal cliffs from the second row of hills — much higher. Here, with the change to the western exposure, again the true macchia appeared, surpassing this time the height of man (Pl. XXIII, Phots. 45, 46), and being rather rich in composition (see record below). But we did not notice any more *Myrtus* and very little *Laurus*.

***Erica-Arbutus*** association near Zunguldak (Bithynia). Altitude: 170—185 m. High macchia on the second row of hills, on the slopes facing W—NW, N and W. (Phot. 46).

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Upper stratum ($1—1^1/_2$ m):

2—3.2 *Erica arborea*
2—3.2 *Arbutus Unedo*
2.1 *Quercus colchica*
1—2.1 *Q. polycarpa*
1—2.1 *Phillyrea media*
1.2 *Tamus communis*
1.2 *Smilax excelsa*
1.1 *Juniperus Oxycedrus*
r.1 *Castanea vesca* — young specimens.
r. 1 *Carpinus Betulus? orientalis?*
r. 1 *Crataegus* sp.
r. 1 *Ligustrum vulgare*
*Rhododendron ponticum*
*Prunus divaricata?*
*Laurus nobilis* — as a small admixture.

Lower stratum (to 40 cm):

| | | | |
|---|---|---|---|
| 1—3.2—3 | *Hypericum calycinum* | 1.1—2 | *Dorycnium latifolium* |
| 2—3.2 | *Erica verticillata* | 1.1 | *Allium* sp. |
| 2—3.2 | *Cistus villosus* | 1.1 | *Carlina* sp. |
| 2—3.3 | *Gramineae* (*Sorghum halepense* and others) | 1.2 | *Helleborus Kochii* |
| | | 1.1 | *Rubus* sp. |
| 1—2.1—2 | *Pteris aquilina* | | *Thalictrum?* |
| 1.1 | *Cistus salviifolius* | | *Viola* sp. |

When making the record, I am sure that many species were omitted. but 2—3 hours stay, under the constant enervating expectation of hearing the siren of the steamer calling us to return, it was not sufficient to study these communities better.

**Coastal shrub communities in Northern Asia Minor.** Let us make now a short summary of what is known about the distribution and existence of macchie and related communities on the southern shore of the Black Sea. Going from the west to the east along Northern Asia Minor. we learn from Endriss (19, p. 406) that on the Kodja-Ili Peninsula macchie (and probably pseudomacchie) cover all uncultivated tracts, from the northern and southern part up to the forests occupying the central part of the Peninsula. These brushwoods are found on the quartzitic underground and soils caused by the weathering of them, more seldom — in a depaupereted form — on limestones. In the lower altitudes evergreen oaks prevail, in the upper ones — oaks with deciduous leaves.

The description of the shrub-communities in the mountains of Cham-Dagh, found at the beginning of the present paper (p. 6) gives an idea of the character of the submediterranean vegetation from more inland localities of Bithynia. Nearer to the sea, according to Tchihatcheff (81, Geologie, vol. II, p. 75), from the outlet of the Sakaria to the outlet of the Milan-Su and farther on to Akcheshehr (see map 2), the coast is covered with brushwoods consisting of *Laurus*. *Erica*, *Carpinus orientalis*, *Corylus Avellana*, *Castanea vesca* and oaks. Farther to the north-east very rich brushwoods continue, in which the olive, however, is still wanting. Nowack noticed (52, p. 7) that the macchie near Akcheshehr reached up to 300 m, and their components were *Laurus*, *Arbutus*, *Ruscus aculeatus* and *Erica*, intermixed with *Rhododendron ponticum*, *Hypericum calycinum*, and *Vaccinium Arctostaphylos* (the latter — only in the higher altitude). *Arbutus Unedo* and *Erica arborea* reached to the greatest altitude, mingling at 300 m with *Fagus* and *Castanea*, which at this elevation constitute the forests.

For the valley of Jonkaly-Dere (to the east from Akcheshehr) Leonhard reports (42, p. 209) *Laurus*, *Myrtus*, *Buxus*, *Oleander* and *Rhododendron*, which vegetation reaches 200 m elevation and reappears on the inland side of the coast ranges — in the plains near Duzje, characterized by the mild and wet climate.

For Eregli the same author cites for the coastal cliffs macchie and small groves of *Pinus* (species?). Handel-Mazzetti (29, p. 49) gives the list of plants constituting near Eregli what he calls "südpontischer Buschwald". There are found in it, on the one hand, typical representatives of Mediterranean vegetation, such as *Laurus nobilis*, *Erica arborea*, *Calystegia silvestris*, *Ficus Carica*, *Rubus* spp., on the other — species of the forest belt, extending from Colchis, through the coastal ranges of Northern Anatolia, to the Stranja mountains in Thrace: *Hypericum calycinum*, *Sophora reticulata* (= *Goebelia Jauberti*), *Daphne pontica*, *Ilex aquifolium*, *Rhododendron ponticum*, *Vaccinium Arctostaphylos* and *Smilax excelsa*. He does not state, however, at what altitude these brushwood communities occur, so we do not know whether the Colchic species reach here the level of the sea, or are confined to the higher elevation.

For Zunguldak we have already given (p. 121) the composition of at least two kinds of macchie, which are found there, and of an oak brushwood. According to Ali-Riza-Rey and Palibine (2, p. 33, 34) the vegetation of the vicinities of this town belongs to the Mediterranean type. They cite for the coastal cliffs: *Marsdenia erecta*, *Osyris alba*, *Ruscus Hypoglossum*, *Parietaria judaica*, *Laurus nobilis*, *Myrtus communis*, *Erica arborea*, *Phillyrea media*, *Arbutus Unedo*, *Cistus tauricus*, *Quercus cerris* and many species of the gound stratum. *Rhododendron ponticum*, *Helleborus Kochii*, *Sophora reticulata*, *Digitalis ferruginea*, and *Trachystemon orientale* may be found also. Such brushwood continues (on the limestone plateau) for 1—2 km inland; at the distance of 3—4 km from the shore forests consisting of *Fagus orientalis* and *Carpinus Betulus* are already to be found. The most typical component of the macchie near Zunguldak — according to these authors — is *Laurus nobilis*. We have to do here — they say — with a true macchia, in the sense of Flahault, Rikli, and Grisebach. If compared with the composition of macchie from more southern localities of Mediterraneïs, it proves to be a poor macchia, for it contains but six evergreen shrubs: *Laurus*, *Myrtus*, *Arbutus*, *Erica*, *Cistus*, *Rhododendron*, of which number the first and the last belong to the forest vegetation. There again (in the more southern localities of Mediterraneïs) more xeromorphic types prevail as:

*Spartium, Calycotome, Anthyllis.* The authors' conclusion is: "Dans tous les cas, la formation de maquis du littoral méridional de la Mer Noire est assez récente et est due à l'assèchement du climat depuis la fin de l'époque post-glaciaire[1]). En général, les conditions climateriques des temps actuels sur le littoral d'Anatolie ne sont favorables ni pour le développement de la flore du maquis adaptée au climat sec, ni pour les éléments de la flore subtropical humide, si bien représentée sur le littoral de la Colchide".

Moving farther eastwards, we pass behind the outlet of the Filias-Chai dark basaltic massif: broad-leaved forests are seen on the cliff and above it (Lebling, 40, p. 92).[2])

In the lower part of the valley Bartin-Su, according to Ainsworth (cited from Leonhard, 42, p. 209) *Laurus, Myrtus, Oleander, Buxus* and *Hedera* constitute dense thickets.

The coast between Amasra and Jidde, according to Nowack (54, p. 3) is especially picturesque, but he gives no particulars of it.

Near Ineboli, after our observations, macchie and small woods consisting of Mediterranean species of trees must have once covered all the slopes (p. 119): higher up they merge into pseudomacchie, which at 900 m is to be found occupying the slopes with southern exposure, while other slopes are occupied by beech- and oak-woods (all at present greatly destroyed). According to Leonhard (l. c.) the Mediterranean

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[1]) Here, in a footnote, they add: "Il n'y a aucun doute que cet assèchement du climat est jusqu'à present le résultat de l'influence du vent sec et froid de ce littoral, qui met obstacle au développement normal du type mésophyte subtropicaux".

[2]) It is curious to note that Lebling has seen *Rhododendron flavum* (*Azalea pontica*) growing on the coastal cliffs to the east from Amasra and the gulf of Tschakras (between Amasra and Jidde, see map 2), which is — as far as I know — the westernmost occurrence of this species on the North-Anatolian coast. The remark of Krause on its distribution (37 II, p. 46): "Im ganzen pontischen Kleinasien von der Küste an bis hinauf zur Waldgrenze häufig" is based on data quite unknown to me. Endriss does not mention it for Kodja-Ili Peninsula, nor Ritsch — for the vicinities of Lake Sabanja. Neither have I seen it in the mountains of Cham-Dagh or Kurmaly-Dagh. It is not mentioned either for the vicinities of Zunguldak by Ali-Risa-Bey and Palibine. Even near Ineboli it is absent in the lower altitudes, growing abundantly from 900 to 1112 m of elevation.

These facts and the existence of widely discontinuous area of *Rhododendron flavum* in Poland and White Russia testify to the great conservatism of this species, and therefore allows us to use its distribution for considerations on the history of the flora of Asia Minor and adjacent countries (more on this subject is to be found in the present author's paper, 18 p. 58, fig. 13).

brushwoods reach near Ineboli an altitude of 750 m. (We have seen *Spartium junceum* at 540 m.)

To the east from Ineboli the coast is monotonous. "Flyschvorland" is covered by brushwoods of *Laurus*, *Arbutus*, *Phillyrea* and *Quercus cerris* (? Stecheiche). For 3—4 km inland from the sea there extend porphyric hills overgrown with brushwoods. Only behind them — on Paleozoic substratum — the "Colchic" forest enters upon its rights. Somewhere between Ineboli and Ayajik Nowack saw "ein prächtiger immergrüner Wald von Lorbeer and Erdbeerbaum" with a strong admixture of *Myrtus*. *Pinus* (species?) was present also and *Abies Nordmanniana* var. *leioclada* descended to the very level of the sea[1]). Besides them he noticed on the slopes consisting of flysch (Cretaceous) much *Spartium junceum* and *Cistus laurifolius*.

For the section of coast between Ayajik and Sinope the same author names *Quercus pedunculiflora*, the beech, the laurel, *Arbutus* (more often *A. Unedo*, but *A. Andrachne* also occurs), *Cornus mas*, *Erica arborea* and *Rhus Coriaria* — the latter in the form of small trees (Nowack, 54, p. 4, 5). We must remember that in the same part of Asia Minor, but 25 km inland — near Djazoglu, we found still rather numerous representatives of the Mediterranean flora, as: *Cistus villosus*, *Rhus Coriaria*, *Cornus mas* and *Ostrya carpinifolia*. All these species were parted from the sea by the chains of mountains having 1400 to 1700 m altitude.

Near Gerse the olive tree is already in cultivation. A little farther on, near Kubafet (Kusafet on Kiepert's map) at the altitude of 250 m, Nowack has seen an oak forest with dense macchia as undergrowth, consisting of *Rhus Cotinus*, *Arbutus*, *Phillyrea*, *Laurus*, *Fraxinus Ornus*: isolated fir-trees were seen growing in macchia.

Between Bafra and Samsun the road, which has only 50 m altitude, leads through a forest of *Quercus conferta*, *Ulmus* sp. and *Alnus*, all entwined with the lianes (l. c. p. 6—8).

Near Samsun Handel-Mazzetti botanized (29, p. 48). To the west from the town he found a kind of "Rock-heath" (Felsenheide), consisting partly of the typical Mediterranean species (*Pallenis spinosa*, *Spartium junceum*, *Psoralea bituminosa*, *Trifolium angustifolium* etc.).

To the east from Uniya Nowack records brushwood of *Erica*, *Arbutus*, *Carpinus*, *Quercus*, *Corylus*, more seldom *Ilex* is to be met with. He supposes that it occupies the space which was covered formerly

[1]) Thus on the whole space from Ineboli to Ayajik and farther on — to near Kubafet — *Abies* is to be found growing at the level of the sea.

with a forest. — From Uniya to Fatisa, according to this author, the shore is very poetical, but he gives no details of vegetation.

Between Fatisa and Ordu, where the road leaves the sea, he found at the altitude of 700 m the remains of forests consisting of *Fagus* and *Castanea*, with the dense undergrowth of *Rhododendron*. About an hour and a half's distance before Ordu, at 30 m altitude, he met with the first plantations of oranges and *Eryobotrya japonica* growing in the open. "Kap Jason ist eine große Scheide" he writes, from there begins the Eastern Pontus with its mild climate. (Nowack, 54, p. 10—12.)

Moving farther in an easterly direction we already enter the area explored and described by Handel-Mazzetti. According to this author there is a zone, extending from the lower part of the slopes of the mountains, steeply falling to the sea, to the altitude of 400—600 m occupied by the shrub-communities of a very characteristic composition, which communities he supposes to be peculiar to the southern coast of the Black Sea. This South-Pontic brushwood zone ("Südpontische Buschwaldzone", 29, p. 18) is chiefly constituted by the Colchic species and the shrub-species of Illyrian karst region, with them are intermingled hard-leaved species of the Mediterranean flora. In the herb-formations developed in the same zone some Mediterranean herbs and grasses also take part.

In the list of plants constituting the brushwoods of the spoken of region we do not find *Arbutus Unedo*, on the other hand, there are present *Juniperus Oxycedrus*, *Paliurus aculeatus*, and *Pyracantha coccinea* — species which are rather characteristic of pseudomacchie than of macchie. *Myrtus communis*, *Laurus nobilis* and *Erica arborea* although present, probably play unimportant part, for the author names as dominant species (Leitpflanzen) the Colchic ones — such as *Rhododendron ponticum*, *R. flavum* and others, which grow here beginning on the very level of the sea upwards — to the limit of the forest (as for *R. flavum* even higher up — to about 1900 m). Near Kerasun *R. ponticum* forms dense brushwoods descending to the shore. Although *R. flavum* inhabits more sunny localities than *R. ponticum*, it avoids the Mediterranean enclaves in the valley of Kalanema-Dere, in which the author discovered a well developed *Pinus Pinea* wood. He points out that in the middle course of the river Dshorokh there is another Mediterranean enclave, bearing again *Pinus Pinea* and *Cistus creticus*.

On the base of the foresaid the following conclusions can be made: narrow coastal strip of Northern Asia Minor is mostly covered with brushwood communities, which in the western

part represent either pure oak-shrubberies or bear the characters of the Mediterranean macchie and pseudo-macchie. As we move in an eastward direction, these last communities become accordingly richer and richer in Colchic species and at the same time they loose some of their Mediterranean components. In this way one of the commonest species of north-western Asia Minor — *Arbutus Unedo* — seems to be totally lacking in the "South-Euxine brushwoods" near Trebizond.

Macchie merge into the South-Euxine brushwoods also in the direction upwards. Thus Palibine names many Colchic species for the environs of Zunguldak, which probably inhabit the region above 100 m. for I have not met with them in a lower altitude. Near Ineboli, where the communities of evergreen type ascend unusually high, they become rich in the Colchic species, namely *Rhododendron flavum*, only at 900 m altitude, where it appears in great masses.

There are certain grounds for supposing that in places the coastal shrub-communities of Northern Asia Minor represent the undergrowth of forests, which were formerly more widely developed. This view is supported by the presence of *Pinus nigra* var. *Pallasiana* and *Abies Nordmanniana* var. *leioclada* in macchie, almost at the level of the sea (Ineboli, between Ineboli and Ayajik, Kubafet), and *Picea orientalis* at 100 m altitude (near Trebizond, Handel-Mazzetti, 29, p. 20)[1]. Even now the forest reaches the very shore of the sea, as for instance between Alaply and Akcheshehr in Bithynia (Leonhard, 42, p. 210), and between Bafra and Samsun in the Pontus (Nowack, 54, p. 8). On the other hand, in certain localities, as for instance on the limestone rocks exposed to the influence of the northern winds near Zunguldak, forest could not exist and the macchie there have to be considered as climax communities, well corresponding to environmental conditions.

Another interesting fact that has to be noted is the occurrence throughout Northern Asia Minor of Mediterranean vegetation on the inland side of the coastal ranges (*Ceterach officinarum*, *Rhus Coriaria*, *Cistus villosus*). They constitute on the southern slopes of the Cham-Dagh in Bithynia the continuation to the east of the Mediterranean vegetation strongly developed on the Peninsula of Kodja-Ili; it seems that farther on in an easterly direction such occurrences are isolated, constituting the enclaves of Mediterranean vegetation in localities

[1]) It is interesting to note that though nobody mentions beech descending lower than 300 m in the coastal strip of Anatolia, I have found beech-forests at inland localities of Bithynia (Cham-Dagh) at an altitude of only 257 m.

situated in "rain shadow", being sheltered from the rain-bearing winds by coastal ranges. Thus Nowack mentions the presence of Mediterranean plants in the "ova" (plain) where Dusje is situated. We again found some Mediterranean plants (*Cistus villosus*) on the inland side of the coastal ranges of Paphlagonia (near Djazoglu). The *Pinus Pinea* forest of Kalanema-Dere near Trebizond, although not separated from the sea by any range, grows on the slopes facing south and south-east (Handel-Mazzetti, l. c. p. 11), thus on the leeward slopes, which probably, besides being strongly isolated, have a much drier climate. The same is probably the case with the occurrence of *Pinus Pinea* in the valley of Chorokh.

The simultaneous existence side by side of *Pinus Pinea* woods and forests of the Colchic type, and still more the merging of macchie into the South-Euxine brushwoods are very instructive facts. The latter shows clearly that the evergreen elements of the Colchic type do not represent an element which could be opposed to the species partaking of the composition of macchie as something cardinally different: they can co-exist, and it is only the drier climate that by eliminating these Colchic species causes the transformation of "South-Euxine" brushwoods into macchie. The true macchie may have originated in the same way throughout the whole Mediterranean Region from brushwoods of the type which still remains in Northern Asia Minor, but which probably extended far to the west in the Pliocene Epoch[1]).

[1]) In this place we think it proper to clarify the relation of our above views to those advanced by the late N. I. Kusnezoff in his well known paper (in Russian) on the Mediterranean elements in Western Transcaucasia (36). My venerable Professor assumed that towards the end of the Tertiary Epoch and the earlier stages of the Present one: (1) the vegetation of the Mediterraneïs was such as is still extant in the Colchic province; (2) the macchie were absent, and their present components constituted the undergrowth of the thin forests growing in the xeromorphic habitats. We assume that the South-Euxine vegetation, such as it exists nowadays in the Colchis, the North of Asia Minor, and the Stranja mountains in Thrace, is the true remnant of that which was, in the Upper Tertiary, peculiar to the eastern section of the Mediterranean Region, while the western section displayed a vegetation of a more oceanic type, such as is found at present in the Canary Islands. (We hope to discuss the latter subject more fully when the work of arranging our collections from Canary Islands will be completed). As regards the components of the true macchie, the data assembled above afford sufficient evidence that they may have been growing in the thin forests as well as co-exist with the Colchic species in the brushwoods of the South-Euxine type.

# The Vicinities of Constantinople.

**Sari-Yar and Rumeli-Kavak.** I have had five opportunities of visiting the picturesque hilly areas above the villages of Sari-Yar and Rumeli-Kavak (Pl. XXVI, Phot. 51), situated on the Bosporus in European Turkey[1]). The first three occasions were during my winter and early spring stay in Turkey, the fourth and fifth occurred before going to and after returning from Anatolia in the summer of the same year.

On both sides of the Bosporus, in Asia and in Europe, at this place which is already near its outlet into the Black Sea, the slopes are covered with dense macchie (Pl. XXVI, Phot. 51). On closer acquaintance with the vegetation, I soon noticed that among the slopes with splendidly developed brushwoods there also occur such as are totally or partly denuded, or at least covered with much lower shrubberies passing to phrygana. It seemed impossible to make the numerous herds of goats grazing on all the slopes responsible for this unequal development, just because they were in no way limited in their coming and going along the slopes. Save the immediate bottom of the valley and rare private gardens surrounded by walls, I did not see any cultivated areas, all was macchia or phrygana, or the transition from one to the other, or thin herb-communities. Probably the great variety in the substratum was responsible for the unequal value of the macchie. The Devonian rocks which form these hills (Tchihatcheff, 81, Geologie, p. 493—499) are represented in the part nearer to the shore (according to the explorations of Prof. Czeczott and Prof. Nikitin) by a series of igneous rocks (porphyries, trachytes, fine-grained granites) and quartzites, in the more distant part — by sandstones and limestones. The last area we hardly touched and — if I remember well — macchie ceased on them, being there replaced by thin grass- and herb-communities. On the quartzitic substratum the brushwood lowered and transformed into thin and low phrygana or a kind of heath — with *Calluna vulgaris* and *Juniperus Oxycedrus*. The best developed macchie were noticed on igneous rocks, where the layer of soil seemed to be thicker than on

[1]) With the exception of Janka they are mentioned by no botanist whose sphere of work lay in the environs of Constantinople.

TABLE V

## MACCHIE ON THE HILLS NEAR THE BOSPORUS (ABOVE SARI-YAR AND RUMELI-KAVAK).

| Locality | Sari-Yar | Between Sari-Yar and Rumeli-Kavak | Sari-Yar | Rumeli-Kavak | Rumeli-Kavak |
|---|---|---|---|---|---|
| No. of observation and date | No. 39<br>12. VI. 25 | No. 40<br>12. VI. 25 | No. 41<br>12. VI. 25 | No. 15[1])<br>16.VIII.25 | No. 35<br>16.VIII.25 |
| Altitude, metres above sea-level | ca. 130 | ca. 159 | ca. 115 | ca. 177 | ca. 183 |
| Exposure . . . . . . . . . . | SW | S—SE | NE | N | W |
| **Stratification and floristic composition** | | | | | |
| Tall-shrub stratum (1—1,6 m): | | | | | |
| *Erica arborea* . . . . . . . | 3.2 | 3—4.2 | 1—2.1 | 2—3.2 | 2—3.2 |
| *Arbutus Unedo* . . . . . . | 2.1 | 3—4.2—3 | — | r—1.1 | 2—3.2 |
| *Quercus infectoria* ssp. *glabra* . | 2.1 | 2.1 | 2.3 | 2.1 | — |
| *Phillyrea media* . . . . . . | 1—2.1 | r.1 | — | r—1.1 | 2.1 |
| *Quercus coccifera* . . . . . . | — | — | — | — | 2.1 |
| *Juniperus Oxycedrus* . . . . | + | — | + | — | + |
| *Pistacia Terebinthus* . . . . | r.1 | + | — | — | — |
| *Spartium junceum* . . . . . | — | 2.2 | — | — | — |
| *Calycotome villosa* . . . . . | — | r.1 | — | — | — |
| *Crataegus monogyna* . . . . | — | r.1 | — | — | r.1 |
| *Ligustrum vulgare* . . . . . | + | — | — | — | r.1 |
| *Prunus divaricata* . . . . . | — | + | — | r.1 | — |
| *Lonicera etrusca* var. *glabra* . | — | + | — | — | — |
| *Pyracantha coccinea* . . . . | + | — | — | — | + |
| *Cytisus syriacus* . . . . . . | — | + | — | — | — |
| *Rubus* spp. . . . . . . . . . | — | — | — | — | 1.1 |
| *Genista tinctoria* var. *mantica* ? | — | + | — | — | — |
| *Pinus Brutia* (small tree) . . | — | — | — | — | r.1 |
| Small-shrub, herb and grass stratum (30—50 cm): | | | | | |
| *Cistus villosus* . . . . . . . | 2—3.2 | 2.2—3 | 1—2.1 | 1.1 | 2.2 |
| *Cistus salviifolius* . . . . . | — | 2—3.2—3 | 2.1 | 2—3.2 | — |
| *Hypericum calycinum* . . . | 1.1 | — | — | 1—2.2 | 3.2 |
| *Erica verticillata* . . . . . . | + | 2.2 | 3.2 | r.1 (fl.) | r.1 (fl.) |
| *Dorycnium latifolium* . . . . | 1—2.2 | 2.1 | — | 1.1—2 | — |
| *Pteris aquilina* . . . . . . | r.1 | 3.2 | — | — | 1.2 |
| *Daphne pontica* . . . . . . | — | r.1 | — | — | — |
| *Helleborus Kochii* . . . . . | — | + | — | 1.2 | — |
| *Epimedium pubigerum* . . . | — | r.1 | — | — | — |
| *Ruscus aculeatus* . . . . . . | + | + | + | — | — |
| *Ruscus hypoglossum* . . . . | — | + | — | — | — |

*(continued)*

TABLE V

| No. of observation and date | No. 39 12. VI. 25 | No. 40 12. VI. 25 | No. 41 12. VI. 25 | No. 15 16.VIII.25 | No. 35 16.VIII.25 |
|---|---|---|---|---|---|
| **Small-shrub, herb and grass stratum** (*cont.*): | | | | | |
| *Avena barbata* | — | 1.1 | 2.2 | — | — |
| *Sorghum halepense* | — | — | — | — | 2.2—3 |
| *Dactylis glomerata* | — | 1.1 | + | — | — |
| *Briza maxima* | — | — | + | — | — |
| *Briza elatior* | + | + | — | — | — |
| *Holcus lanatus* | + | — | + | — | — |
| *Pulicaria dysenterica* | — | — | — | — | 2.1 |
| *Stachys Thirkei* | 1.1 | — | — | — | — |
| *Carlina corymbosa* var. *graeca* | — | — | — | — | 1.1 |
| *Anthemis tinctoria* | — | r.1 | 1.1 | — | — |
| *Calamintha Nepeta* | — | — | — | r.1 | — |
| *Scrophularia canina* | — | — | — | — | 1—2.1—2 |
| *Pallenis spinosa* | — | + | — | — | — |
| *Galium* sp. | r.1 | 1.1 | 1.1 | — | — |
| *Oenanthe pimpinelloides* | — | — | 1.1 | — | — |
| *Viola alba* var. *violacea* | — | r.1 | — | — | + |
| *Hypericum perforatum* | + | — | — | — | — |
| *Psoralea bituminosa* | + | — | — | — | — |
| *Lysimachia punctata* var. *villosa* | — | + | — | — | — |
| *Silene dichotoma* | + | — | + | — | — |
| *Silene inflata* | + | — | — | — | — |
| *Arum Nickelii* | + | — | — | — | — |
| **Mosses and lichens**[2]): | no record | no record | | no record | no record |
| *Hypnum cupressiforme* | | | + | | |
| *Bryum* sp. | | | + | | |
| *Grimmia campestris* | | | + | | |
| *Cladonia rangiformis* var. *pungens* | | | + | | |
| *Cladonia alcicornis* | | | + | | |
| *Ramalina farinacea*[3]) | | | + | | |
| *Evernia prunastri* | | | + | | |
| **Creepers**: | | | | | |
| *Rubia peregrina* | 1.1 | — | — | — | — |
| *Smilax excelsa* | + | — | — | + | — |
| *Clematis Vitalba* | + | — | — | — | — |
| *Calystegia silvestris* | + | — | — | — | — |

[1]) A low macchia in an unsheltered position.
[2]) Mosses and lichens were recorded in the winter time (25. I. 25).
[3]) This species and the next one were found growing on the twigs of *Cistus*.

the sandstones. In the above table are given all species which were met with in brushwoods in the region mentioned (Table V). Species marked with a + but not bearing any symbols (of abundance or frequency and of sociability) were collected in the places where I did not make the record of the communities.

Brushwoods from near the Bosporus, although not displaying a great variety in their evergreen elements, are well developed formations, allowing without hesitation the application of the name of macchie. Colchic or South-Euxine elements, being components of the coastal brushwoods of Northern Asia Minor — in a steadely weakening degree from east to west — are also present here. As instances collected by me may serve: *Helleborus Kochii*, *Epimedium pubigerum*, *Daphne pontica*, and *Hypericum calycinum*, to which I shall add, discovered by others: *Sophora* (*Goebelia*) *Jauberti*, *Trachystemon orientale*, *Lathyrus undulatus*, and *Hypericum bithynicum*. The continuity of the phenomenon of intermixture of Mediterranean and Colchic elements testifies to the common past history of the territories under consideration. The occurrence of a series of Colchic species in the region of the Bosporus indicates that the Bosporus could not create in the past a break in the distribution of the South-Euxine species, for it has been like those rivers now cutting the coastal ranges of Northern Anatolia: along them the Mediterranean vegetation extends deeper inland, but from the mountains in the "hinterland", covered with forests, descend the shrub and herb species of the South-Euxine element and they mingle together. The Bosporus — as it is now — has lost its "hinterland" forest region; the Colchic species keep distinctly to the north-eastern part of the region, constituting with their occurrences the connecting link between the areas covering Northern Asia Minor, on the one hand, and the Stranja mountains, on the other. But formerly, when the Marmara- and Aegean Sea were land (Pliocene Age), it would hardly be a mistake to say that the "river" Hellespontus-Bosporus[1]) had just such wooded "hinterland", as every river of the North Anatolian coast has, and that these forests were very likely of the same South-Euxine character. The occurrence of *Fagus orientalis* in Macedonia, a very probable one in the Tekir-Dagh, on the Hagion Oros Peninsula, and on the Thessalian Olympus[2])

[1]) Cp. Hoernes, 32, p. 693—700, 741—744, 755.

[2]) See Czeczott, 17, p. 381; Černjavski, 15, p. 91; Mattfeld, 48, p. 67; Grebenščikov, 25, p. 171. According to a more recent publication of the latter author, *Fagus orientalis* is indubitably present in the Athos and Chalcidice Peninsula and on Mt. Ossa (Bull. Misc. Inf. Kew. No 1, 1938, p. 38—45).

supports this view. Also the station of *Rhododendron flavum* (if it really exists!) in "Littore Hellesponti: inter Tchanak-Kalessi et Inedje", that is in the immediate proximity of the coasts of the Dardanelles[1]), favours this view.

Returning to Sari-Yar and Rumeli-Kavak, we have to state that besides macchie we saw there grassy spots devoid of any shrubs. In such places *Hordeum bulbosum*, *Avena barbata*, *Aegilops ovata* displayed a high degree of sociability. In the same places, in the early spring time, the first blossoming plants were: *Ornithogalum nanum* and *Viola alba* var. *violacea*.

We must also mention the great abundance of *Arum Nickelii* in the ravines and in macchie and the presence of *Primula acaulis* var. *rubra* in the shady ravines on heavy wet clayey soils.

During our summer excursions to Rumeli-Kavak, we were struck by the great number of big, pretty yellow turtles, that could be seen quietly walking in the macchie and along the roads[2]).

The fishermen's village of Rumeli-Kavak deserves a visit on account of the group of huge specimens of *Platanus orientalis* growing there. A café is established in their shade and large nets are dried on their branches. The combination of the red fezes of the indolent crowd under the dainty nets floating in the air among the huge shady trees, is one of the prettiest pictures that have remained in my memory from my travels in Turkey.

**The island of Prinkipo in the Marmara Sea.** My husband and I visited this island on the 26th of February. This spring and late-summer resort of the richer families of Constantinople and the beloved aim of excursions is reached by comfortable steamers, circulating several times a day between the whole group of Princes Isles (in Turkish: Kyzyl-Adalar) and the city.

While on the European side of the Bosporus we had noticed but very few early spring species flowering, here we found spring in its full charm. Fruit trees (many *Prunus armeniaca*) were just blossoming and numerous mimosa-trees in the gardens looked like golden dainty dreams. Dark columns of cypresses and of "umbrellas" of *Pinus Pinea* were there, as if to underline still more the brightness of the colour of the flowering trees and of the blue sea and sky.

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[1]) Tchihatcheff, 81, Botanique, vol. I, p. 467.

[2]) In Constantinople they are kept in some restaurants as pet animals and do good service as well, for they keep the ground of the restaurant gardens clean from the crumbs thrown from the tables.

Lying at a distance of but a few kilometres from the southern shore of the Kodja-Ili Peninsula, and being sheltered by it from the cold northern winds, the Princes Islands enjoy a very soft climate, allowing many plants to grow there, which are not to be found on the shores of the Bosporus. Olive tree which grows very seldom in the region of the Bosporus (only on slopes facing west, sheltered from east and north), in these island is not only cultivated (Pl. XXIV, Phot. 47), but is found also growing abundantly in its wild form (*Olea europaea* var. *Oleaster*). In the gardens are cultivated even orange trees, which could not exist near Constantinople.

The largest island of the group — Prinkipo — being situated so very near to the old Turkish capital and easily accessible — has been visited by many botanists, but I have not found any more exhaustive description of its flora than a small paper by Béguinot (7). Neither is the number of species inhabiting it known.

Geologically both the largest islands consitute the torn out part of the near-by continent and are of the same Devonian age as the adjacent part of the Kodja-Ili Peninsula. According to Tchihatcheff (81. Geologie, vol. I, p. 513) Prinkipo consists of limestones (of a very varied character), but the highest summit of the island constitutes bare quartzites. Both summits, having 163 and 200 m, are occupied by cloisters and are separated from each other by a depression: this varied morphology makes the island very picturesque (Pl. XXIV, Phot. 47).

The northern part of the island and the ridge are covered with a thin wood, consisting of *Pinus Brutia* Ten. (Pl. XXIV, Phot. 48). At the time of our visit the trees were strongly attacked by fell webworm, notwithstanding this — abundantly fruiting. In the picture (Pl. XXV, Phot. 49) may be noticed the rich branching of this pine, beginning rather low above the surface of the ground[1]).

The undergrowth of these woods forms macchie of a rather varied composition. I noticed the following species: *Juniperus Oxycedrus* var. *microcarpa*, *Quercus coccifera* (very frequent and abundantly fruiting), *Erica arborea*, *Phillyrea media*, and in the lower layer — *Erica verticillata*, *Lavandula Stoechas* (just beginning to blossom) and *Cistus villosus*[2]).

[1]) Photo 48 has been kindly lent to me by Dr. Tad. Wiśniewski (Warsaw), to whom I tender my best thanks.

[2]) We may add some species, which occur in macchie of this island, from the mentioned paper by Béguinot; they are: *Arbutus Unedo*, *Pistacia Lentiscus*, *Pistacia Terebinthus*, *Poterium spinosum*, and *Cistus salviifolius*, and from the list given by Handel-Mazzetti (29 p. 154) we may mention *Laurus nobilis*.

In the southern and south-western part of the island[1]) the macchie attains its best development (Pl. XXV. Phot. 50). Here I noticed that the wild olive, in the form of shrubs and three metres high trees was a frequent component of the brushwood. It was fruiting very abundantly. In one place — on the verge of the macchia — I found a pretty flowering specimen of *Romulea graeca* var. *Sintenisii*.

One of the summits, namely the higher one, was also visited. In addition to the beautiful view which extends from there on the bluish mountains bordering the gulf of Ismid from the south, we found that the ridge really consisted of bare quartzites, in the fissures of which a whole company of early flowering species was met with. Namely: *Erodium cicutarium*, *Gagea amblyopetala*, *Calendula arvensis*, *Ranunculus caltaefolius*, *Ornithogalum montanum* (in buds) and a small fern — *Asplenium oboratum*.

With this most pleasant excursion we closed our first stay in Turkey, never expecting to come again, and that so soon to continue the exploration of this highly interesting country.

I shall end this first part of my paper with the eulogy of the cypress-groves, the like of which are probably not to be found anywhere else. In this most beautiful of capitals death seems to be less dreadful than elsewhere, for graves (old ones) are to be found in the very heart of the city — in Stamboul — interspersed among the houses, causing a well-known man of letters to write about Constantinople: "Les morts et les vivants s'y mêlent". But they are in innumerable numbers in the vast cemeteries surrounding the capital. *Cupressus* is considered a mourning tree by the Turks, hence it is grown almost exclusively in the burial grounds, creating unforgetable pictures. Such a cypress-wood — and a very large one — can be seen at Scutari, already on the Asiatic coast, but the most beautiful large grove is to be found at the end of the Golden Horn, on the hills on the right-hand side, where the famous cemetery of Eyub is situated (Pl. XXVI, Phot. 52). In the grave-yards *Cupressus pyramidalis* prevails, but the other variety also occurs — *Cupressus horizontalis*, e. g. in the valley of Kastane-Su near Rumeli-Kavak. The most inland locality where the cypress has been noticed by me was the cemetery of the town of Ada-Bazar, where I saw a huge single tree.

[1]) The whole island can be very conveniently circled in 2—3 hours on donkeys.

# PART II

# SYSTEMATIC LIST OF PLANTS COLLECTED AND NOTES.

For the sake of convenience the plants have been arranged according to the system adopted by Boissier in his "Flora Orientalis". The literature of the subject is quoted only for species and forms not found in that main work, and this is mostly not included in the List of Literature referred to in the text. The list also includes a few species not collected, but unmistakably seen by me, and a few species collected by Mr. Musa Sabri, the Turkish student of the Mining Academy in Cracow. The names of all new species, subspecies, varieties and forms described by myself or others on the basis of my materials are printed in heavy type, no matter whether they habe been previously published or not.

My first intention, viz. to note by special marks the connection of each species in the list with certain geographical elements, proved unrealizable. Our knowledge of the different parts of Asia Minor is so meagre that the distribution of most species within the Peninsula is unknown and the establishment of phytogeographical subdivisions is as yet impossible.

The chief part of the collections remains in my private herbarium in Warsaw, duplicates will be found: in the Physiographical Museum of the Polish Academy of Sciences in Cracow, in the Herbier Boissier in Geneva, and in the Herbarium of the Principal Botanic Garden in Leningrad.

Since 1930, when this list was ready for printing, some monographs and smaller contributions have appeared on the flora of the Near East. This necessitated certain additions and changes in the text of part II, which have been introduced as far as possible (mostly as footnotes).

# Dicotyledones.

## *Ranunculaceae.*

*Clematis Viticella* L. — Bithynia: inter Hendek et Ada-Bazar, in fruticetis ad ripam fluminis (29. VI. — No. 135).

*Clematis Vitalba* L. — Circa Byzantium: in rubetis prope pagum Sari-Yar (26. I. — No. 710). — Bithynia: circa Hendek, in valle Ulu Dere (II. — No. 721): prope pagum Shekhlar in faucibus, arboribus et fruticibus implexa, ca. 190 m (28. VI. — No. 133). — Paphlagonia: prope pagum Yailadjik (vallis Ilgaz-Su), in rubetis ad fossam, ca. 1130 m (23. VII. — No. 329). Inter Sinopen et Tasköprü, in valle fluminis Kuru-Chai, in fruticetis *Pyracanthae coccineae*, *Ruborum*, *Quercuum* etc. (3. VIII. — No. 522).

*Thalictrum angustifolium* Jacq. β *heterophyllum* Koch (= *T. nigricans* DC.). — Bithynia: inter Hendek et Ada-Bazar, in locis humidis ad flumen Mudurlu (23. VI. — No. 56).

*Adonis flammea* Jacq. — Galatia: inter vallem fluminis Yanar et oppidulum Arab. prope agros, ca. 1250 m (16. VII. — No. 291).

*Ranunculus calthaefolius* Jordan. — Ins. Prinkipo: ad cacumen insulae, in fissuris nudorum saxorum quarciticorum, copiose (26. II. — No. 711).

*Ranunculus Brutius* Ten. var. *latilobus* Freyn. — Über neue und bemerkenswerte orientalische Pflanzenarten, Bull. Herb. Boiss., Tome III, 1895, p. 34. — Paphlagonia: in declivitate septentrionali montis Kush-Kayasy (jugum Ilgaz-Dagh), in abieteto, ca. 1940 m (26. VII. — No. 520); in declivitate septentrionali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m (28. VII. — No. 377).

In the above-mentioned paper Freyn raises the variety of *R. Brutius*, var. *latiloba* previously distinguished, to a higher rank — subspecies *Ranunculus anatolicus* Freyn et Sint. My revision of all specimens of *R. Brutius* and its forms in seven herbaria, inclines me to retain the varietal name *latiloba*, because: 1) there is no difference in the flowers and fruits of the Italian and Anatolian plants; 2) the variety *latiloba* seems to be limited to more inland localities, the typical form — to those nearer to the sea, consequently the specimens from near Trebizond (Djimil) more closely resemble

the Italian plants than the specimens originating from the inland mountain-massifs of Anatolia; 3) in the Bithynian Olympus and Murad-Dagh (Mysia) exist transitional forms between the typical form and the *latiloba*; 4) the general character of the area of *Ranunculus Brutius*[1]) — extending from Transcaucasia to Italy — speaks, by analogy with the distribution of other forest species of Northern Anatolia, against the existence of a parallel form.

*Helleborus Kochii* Schiffner. — Monographia *Hellebororum*, 1890. p. 85. — Circa Byzantium: in collibus inter Sari-Yar et Rumeli-Kavak, in margine macchiae (26. I. — No. 712): supra pagum Sari-Yar, in margine macchiae, ca. 60—100 m (2. III. — No. 722).

*Helleborus Kochii* Schiffn. var. *hirtus* Schiffn. (= *H. orientalis* Koch) l. c. p. 87. — Bithynia: circa Hendek, in valle Ulu-Dere, in margine fruticetorum *Rhododendri* (3. II. — No. 717).

*Helleborus Kochii* Schiffn. var. *glaber* Schiffn. — l. c. p. 87. — Paphlagonia: prope Edjevid, sub umbra arborum et in pratis silvestribus, ca. 1100 m (6. VIII. — No. 521).

*Nigella arvensis* L. β *glauca* Boiss. — Galatia: circa Angora, in collibus stepposis ad orientem urbis, substrato trachytico, ca. 1200 m (5. VII. — No. 154).

*Delphinium Raveyi* Boiss. — Galatia: prope pagum Bunarkeui (inter Tukht et Changri), in collibus stepposis, ad marginem segetum, ca. 1250 m (10. VII. — No. 565). — Paphlagonia: inter Tukht et Changri, in collibus stepposis ad orientem vergentibus, ca. 1100 m (15. VII. — No. 272).

*Delphinium orientale* L. — Galatia: inter Angora et Changri, in collibus stepposis, in margine agrorum cultorum, ca. 1000 m (10. VII. — No. 176). — Paphlagonia: prope oppidulum Tukht, in margine segetum, ca. 1250 m (11. VII. — No. 199).

## *Berberidaceae.*

*Epimedium pubigerum* Morr. et Decaisne. — Circa Byzantium: supra pagum Sari-Yar, in faucibus ad rivulum, in macchia (2. III. — No. 713). — Bithynia: circa pagum Bichki-Dere, in declivitate occidentali montis Geuk-Tepe (jugum Kurmaly-Dagh), in fageto, copiose, ca. 300 m (30. VI. — no. 144).

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[1]) The distribution of *Ranunculus Brutius* Ten. is dealt with in: Czeczott, 18, p. 50, fig. 6.

*Berberis crataegina* DC. — Galatia: inter Changri et Arab, ad flumen Yanar-Chai, in consortio *Elaeagni hortensi* (16. VII. — No. 524). — Paphlagonia: supra oppidulum Tukht. loco Armutly-Yelik dicto, in declivitate saxosa, ca. 1400 m (13. VII. — No. 242).

## *Papaveraceae.*

*Glaucium corniculatum* L. — Paphlagonia: prope pagum Yailadjik (vallis Ilgaz-Su). in latere austro-occidentali praeruptorum, inter herbas stepposas, 1130 m (23. VII. — No. 330).

*Glaucium flavum* Crantz (= *G. luteum* Scop.). — Fr. Fedde, Papaveraceae in Engler. Das Pflanzenreich IV. 104. 1909. p. 233. — Paphlagonia: prope Ineboli, in arenis maritimis, copiosissime (8. VIII. — No. 525 et 525 bis).

*Glaucium* sp. nov.?

Caules pilis papillosis sparsis hirsuti, tortuosi. Alabastra paula, ovoidea. Petala lateritio-fulva. Siliquae breves, tota longitudine tuberculato-scabrae.

Paphlagonia: prope pagum Kuru-Chai (inter Sinopen et Tashköprü), in praeruptis nudis, rarum (3. VIII. — No. 526).

As leaves are totally lacking I do not attempt a fuller description of this probably new species.

## *Cruciferae.*

*Cardamine impatiens* L. — Bithynia: circa Hendek, in fageto ad rivulum vallis Su-Atak-Dere, ca. 465 m (26. VI. — No. 110). — Paphlagonia: inter Küre et Edjevid, in silva mixta montis Kush-Tepe. ca. 1350 m (5. VIII. — No. 527).

*Dentaria bulbifera* L. — Bithynia: circa Hendek, in fageto ad rivulum in valle Su-Atak-Dere. ca. 520 m (26. VI. — No. 117).

*Fibigia clypeata* L. — Paphlagonia: supra oppidulum Tukht, in declivitate montis Bokly-Tepe, in fruticibus *Quercuum*, ca. 1600 m (13. VII. — No. 235). Prope pagum Yailadjik. in fruticetis fluviaticis vallis Ilgaz-Su, in confinio pinetorum, ca. 1500 m (18. VII. — No. 530).

*Alyssum tortuosum* W. K. (= *A. alpestre* L. β *suffrutescens* Boiss.). — N. Busch, Cruciferae. Fl. cauc. crit., fasc. 26, 27, 1910, p. 558. — Paphlagonia: supra oppidulum Tukht, loco Chirchir-Bunar dicto, in declivitate meridionali collium stepposorum, ca. 1540 m (12. VII. — No. 208).

*Alyssum obtusifolium* Stev. — N. Busch. l. c. p. 567. — Paphlagonia: in declivitate meridionali montis Kush-Kayasy (jugum Ilgaz-Dagh), in steppa montana, ca. 1300 m (26. VII. — No. 532)? Prope pagum Djazoglu (inter Sinopen et Tashköprü), in fissuris saxorum et praeruptis versus rivulum Kuru-Chai, ca. 850 m (31. VII. — No. 400).

The specimens under the last number are strikingly similar to those of Callier from the Crimea (No. 535, It. Taur.), considered by Busch as typical specimens of this species.

*Alyssum minutiflorum* Boiss. — Diagn. plant. orient. nov. vol. I, fasc. 1. 1842, p. 73. — Galatia: circa Angora, in collibus stepposis ad orientem urbis, solo trachytico, ca. 1200 m (7. VII. — No. 173). — Paphlagonia: supra oppidulum Tukht, in declivitate meridionali nuda et lapidosa, montis Bokly-Tepe, ca. 1700 m (13. VII. — No. 531).

*Draba olympica* Sibth. β *bruniaefolia* Boiss. — Paphlagonia: in cacumine montis Büyük-Ilgaz-Dagh, ca. 2500 m (24. VII. — No. 528); in cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m (26. VII. — No. 529).

*Iberis olympica* Boiss. — Paphlagonia: in cacumine montis Büyük-Ilgaz-Dagh, ca. 2500 m, rarior (24. VII. — No. 348).

***Aethionema paphlagonicum*** Czeczott et Beauverd (Pl. XXVII. Fig. 2) — Act. Soc. Bot. Polon. IX, 1932, p. 31[1]).

Sectio: *Eu-aethionema*. Perennia suffruticosa. — Silicula bilocularis, loculis biovulatis. — Boiss, Fl. Or. I, 341, vel sectio *Thlaspidopsis* — Busch, Fl. cauc. crit., fasc. 16, 1907, p. 131.

Glabrum, suffruticosum, multicaule. Caules suberecti, simplices vel parce ramosi, ad apicem usque foliosi, 9—11 cm alti. Folia omnia lanceolata, acutiuscula, glauca, carnosula, 7—11 mm longa, 3—5 mm lata. Racemi floriferi densiusculi, 1—2 cm longi, pedicellis calyci subaequilongis, demum elongatis. Flores mediocres, sepalis ca. 3 mm longis, petalis violaceo-roseis (in sicco), ca. 5 mm longis. Filamenta maiora basi dilatata, superne acute dentata, supra dentem abrupte attenuata. Racemi fructiferi breviusculi, 2—2,5 cm longi, laxiusculi. Siliculae biloculares, loculis biovulatis, ambitu suborbiculares, transverse vix latiores, immaturae 5 mm longae, ca. 5 mm latae, in basi sinu late aperto, in apice sinu sub-

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[1]) The diagnoses of all my new species and subspecies of the Phanerogams collected in Turkey were published in 1932 in Acta Societatis Botanicorum Poloniae, vol. IX, No. 1—2, 1932, p. 31—45.

clauso emarginatae, tota longitudine late alatae. Alae utrinque loculo latiores, irregulariter crenato-dentatae. Stylus ad 4 mm longus, sinum multo superans.

Paphlagonia: in cacumine montis Büyük-Ilgaz-Dagh, alt. ca. 2500 m (24. VII. — No. 566).

In habit our new species recalls *Ae. graecum* Boiss. et Spr. and *Ae. speciosum* Boiss. et Huet, but is easily distinguished from the former by the orbicular (not elongate) form of the siliculae, crenate (not entire) alae and lanceolate (not ovate) leaves, from the latter — by the 2-spermic loculae, very distinct open sinus in the basal part of the silicula and dentate filaments.

## *Resedaceae.*

*Reseda lutea* L. — Paphlagonia: circa Kastamuni, in collibus stepposis, in fissuris rupium calcarearum, ca. 870 m (4. VIII. — No. 418).

*Reseda Luteola* L. — Paphlagonia: prope pagum Yailadjik (vallis Ilgaz-Su), in vervacto, frequens, ca. 1130 m (23. VII. — No. 323).

## *Cistaceae.*

*Cistus villosus* L. var. *tauricus* (Presl) Grosser. — Cistaceae in Engler, Das Pflanzenreich IV, 193, 1903, p. 14. — Circa Byzantium: supra pagum Sari-Yar, in macchia, copiosissime, fl. (12. VI. — No. 32). Bithynia: circa Hendek, inter viculos Shekhlar et Ermeni-Djedjid, in declivi meridionali montis Cham-Dagh, locis apertis prope quercetum, ca. 200 m (27. VI. — No. 111). — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere vallis Chamkey-Su, in fruticetis *Quercuum*, locis apertis gregatim, ca. 900 m (31. VIII. — No. 536).

*Cistus villosus* L. var. *creticus* (L.) Boiss. — Circa Byzantium: supra pagum Sari-Yar, in macchia, frequens, fr. (25. I. — No. 811). Ins. Prinkipo: in macchia et in pineto copiosissime, fr. (26. II. — No. 794).

*Cistus salviifolius* L. — Circa Byzantium: supra pagum Sari-Yar in macchia, frequens, fol. (25. I. — No. 812); ibidem, in totum fere defloratus (12. VI. — No. 31). Supra pagum Rumeli-Kavak, in macchia, copiosissime, fol. (16. VIII. — No. 535)? Bithynia: circa Hendek, prope pagum Shekhlar, in declivitate meridio-occidentali montis Cham-Dagh, in macchia, ca. 195 m (7. II. — No. 762).

*Cistus laurifolius* L. (Turkish: pamyk-lava). — Paphlagonia: supra oppidulum Küre, in declivitate montium ad orientem vergente, in loco silvae destructae, ca. 1750 m (non lectum); prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere meridio-orientali vallis Chamkeui-Su, in fruticetis *Quercuum*, copiosissime, ca. 950 m (30. VII. — Nr. 399); ibidem, in latere montis Khadji-Aghach, in silva *Pini nigrae*, gregatim, ca. 1300 m, fl. (1. VIII. — No. 534).

*Helianthemum nitidum* Clementi f. *glaucescens* (Murbeck) Janchen (= *Helianthemum Chamaecistus* subsp. *barbatum* var. *serpyllifolium* Grosser). — Die Cistaceen Österreich-Ungarns, Mitt. d. Naturw. Vereins Univ. Wien, 1909, p. 73. — Paphlagonia: in declivitate graminosa ad cacumen montis Büyük-Ilgaz-Dagh, ca. 2450 m (24. VII. — No. 432).

*Helianthemum rupifragum* Kerner f. *orientalis* (Grosser) Janchen (= *Helianthemum oelandicum* L. var. *penicillatum* [Thib.] Boiss.). — *Helianthemum canum* und seine nächsten Verwandten. Abh. d. K. K. Zool. Gesellsch. in Wien, Bd. IV, H. 1, 1907. — Paphlagonia: in regione alpina montis Büyük-Ilgaz-Dagh, ca. 2500 m (24. VII. — No. 430); in cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), in graminosis alpinis, ca. 2400 m (26. VII. — No. 431).

## *Violaceae.*

*Viola hirta* L.? — Bithynia: in valle Bichki-Dere (jugum Kurmaly-Dagh). in declivitate montis Geuk-Tepe, in fageto, frequens, ca. 300 m (30. VI. — No. 140).

*Viola alba* Besser var. *violacea* Wiesb. — Wilhelm Becker, *Violae* Europae, 1910, p. 21. — Circa Byzantium: supra pagum Sari-Yar in declivibus nudis versus Bosporum, gregatim, ca. 60—100 m, fl. (2. III. — No. 714).

## *Polygalaceae.*

*Polygala supina* Schreb. — Galatia: supra oppidulum Arab. in latere septentrionali vallis Yaila-Chai (mons Eldiven-Dagh), in pineto, ca. 1350 m, satis frequens (18. VII. — No. 296); ibidem, in fruticetis ad rivulum in valle Yaila-Chai, ca. 1450 m (19. VII. — No. 538). — Paphlagonia: in declivitate meridionali montis Büyük-Ilgaz-Dagh, haud procul a cacumine et in ipso cacumine. ca. 2450 m (24. VII. — No. 345).

*Polygala anatolica* Boiss. et Heldr. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in depasta declivitate

montis, ca. 1540 m (13. VII. — No. 245); ibidem, in abieteto montis Panair-Tepe, ca. 1900 m (14. VII. — No. 245 bis). In declivitate meridio-orientali montis Büyük-Ilgaz-Dagh, in pineto, satis frequens, ca. 1950 m (24. VII. — No. 332). Supra vicum Djazoglu (inter Sinopen et Tashköprü), in declivibus meridionalibus montis Khadji-Aghach, in pineto, alt. 1400—1700 m (1. VIII. — No. 537).

## *Caryophyllaceae.*

***Dianthus ilgazensis*** Czeczott (Pl. XXVIII. Fig. 1a, 1b) — l. c. p. 32.

Sectio: *Tetralepides Leiopetala*; Subsectio *Cintrani*. — Caules 4-angulares. Bracteae stramineae. — Williams, A monograph of the Genus *Dianthus* Linn., Journ. Linn. Soc. XXIX, 1892, p. 375.

Rhizoma durum, caudiculos prostratos, elongatos, ramosos, caules floriferos turionesque steriles emittens. Caules 20—30 cm alti, adscendentes, tetragoni, uniflori, inferne scabriusculi, plus minus dense foliati, apice versus remote et adpresse foliati. Folia lineari-lanceolata, rigida, acuta, 3—5-nervia, in margine scabra, radicalia ad 23 mm lg., 1—1½ mm lata, caulina 27—10 mm longa. Flores maiores, odorati. Squamae quaternae, adpressae, stramineae, leves, glabrae, 7 mm longae, exteriores obovatae vel lanceolatae, interiores latiuscule ovatae, in mucronem obtusiusculum viridi-striatum abeuntes, calyce subduplo breviores. Calyx 16—18 mm longus, viridis vel stramineo-fuscus, striatus, apice attenuatus, dentibus lanceolatis, acutis, margine ciliatis vel glabris. Petala 23—26 mm longa, crenato-dentata, glabra, margine laterali saepe undulata (post anthesin?). Lamina 10 mm longa, 4 mm lata, obovato-cuneata, alba, subtus concolor (ex sicco) vel ferrugineo-fuscata, ungue subduplo brevior.

Paphlagonia: in cacumine montis Büyük-Ilgaz-Dagh, inter herbas alpinas, ca. 2500 m (24. VII. — No. 346).

Specimens collected by Sintenis in the same mountain-chain, No. 4188, It. or. 1892, Tossia: Giaur-Dagh, and determined by J. Freyn as *Dianthus pallens* Sibth. f. *grandiflora uniflora*, are certainly *D. ilgazensis*.

It is related to two species, which also inhabit alpine regions in Asia Minor, namely — *Dianthus leucophaeus* Sibth. (from the Bithynian Olympus) and *Dianthus eretmopetalus* Stapf (from the Ak-Dagh in Lycia; considered by Williams as a variety of the former species). Our new species differs from the former by the caudicles and stems being more elongated, and the lower part being

sparsely foliate (not imbricately foliate), leaves being longer and narrower, squamae — more adpressed (instead of spreading obliquely). From the latter it is distinguished by the larger stature, different dimensions of calyx, squamae, and petals, and the colour of flowers.

***Dianthus eldivenus*** Czeczott (Pl. XXVIII, Fig. 2) — l. c. p. 33.

Sectio: *Tetralepides Leiopetala.* — Williams. Mon. Genus *Dianthus*, 1892, p. 357.

Caespitosus, glaucescens. Caules 25—30 cm alti, teretes, interdum puberulo-scabridi, superne ramosi, ramis uni- vel bifloris. Folia lineari-subulata, acuta, stricta, margine scabrida, puberula, nervis tribus prominentibus percursa, basilaria 20—30 mm lg., patentia, caulina 15—20 mm lg., adpressa, vagina albida folii diam. duplo longiore. Flores parvi, albi, ad 16 mm longi. Squamae quaternae (rarius subsenae), pallidae, glabrae, oblongae, interiores latiores, hyalino-scarioso-marginatae, longiuscule abrupto-acuminatae, acumen versus ochro- vel virenti-striatae, calycis dimidium subaequantes. Calyx ad 12 mm longus, cylindricus, apicem versus attenuatus, tenuissime viridi-striatus, basi vix fuscescens, dentibus lanceolatis, acutis, viridi-nervosis, in margine albo-membranaceis, ciliolatis. Lamina ± obsolete crenulata, subrhomboidea, alba, subtus virescens (5—7 mm lg., 2½—3 mm lata), ungue subtriplo brevior. Capsula . . .

Galatia: supra oppidulum Arab, in pinetis vallis Yaila-Chai (in declivibus montis Eldiven-Dagh), alt. ca. 1350 m (18. VII. — no. 543).

This pretty species, having the general appearance of *Dianthus Kotschyanus* Boiss., is distinct from all other related *Leiopetalae.*

*Dianthus crinitus* Sm. — Galatia: circa Angora, in declivibus meridionalibus collium trachyticorum ad orientem urbis, in fissuris saxorum, ca. 1200 m (5. VII. — No. 151).

*Dianthus Carthusianorum* L. — Paphlagonia: in jugo Ilgaz-Dagh, in declivi viae ad septentrionem vergente, ca. 1650 m (28. VII. — No. 540).

*Dianthus Carthusianorum* L. var. *carmelitarum* (Reut.) Williams. — Mon. Gen. *Dianthus*. Index, 1892, p. 552. — Paphlagonia: prope Edjevid, in margine silvae (*Pinus, Abies*), juxta viam, ca. 1100 m (6. VIII. — No. 466).

*Dianthus lydus* Boiss. — Galatia: supra oppidulum Arab, in fissura rupis, juxta viam, una cum *Vincetoxico canescente,* ca. 1200 m

(15. VII. — No. 280 bis); ibidem, inter plantas viales, in positione boreo-orientali, ca. 1400 m (16. VII. — No. 283).

*Saponaria prostrata* Willd. — Galatia: inter oppida Changri et Tukht. in collibus stepposis, passim copiosissime, ca. 1000 m (11. VII. — No. 194).

***Gypsophila Henrici*** Czeczott (Pl. XXIX) — l. c. p. 33.

Sectio: *Suffruticosae*. — Boiss., Fl. Or. I, p. 535.

Planta elata, caulibus e radice crassissima numerosis, basi glabrescentibus, inflorescentiam versus gradatim glaucescentibus, superne densissime et patule hispidulis, in paniculam elatam, ramosam, substrictam abeuntibus. Folia stricta virescentia, subulata, carnosa, perspicue uninervia, acutiuscula, margine convoluta, utrinque breviter scabriuscula. Cyma elongata, laxiuscula, multiflora, pedicellis densissime et patule hispidis, calycem aequantibus vel 2—3-plo longioribus. Calyx campanulatus, dense longeque patule papillari-hispidus, lobis oblongis, obtusiusculis, abrupte acuminatis, margine brevissime papillosis. Petala alba, lineari-cuneata, retusa, calyce sesquilongiora, venis tribus percursa, quarum media apice bifurcata, libera vel anastomosante. Ovarium 6-ovulatum.

Dimensiones: caules floriferi ca. 60 cm alti; caules steriles foliosi 28—40 cm alti; folia (1)—2½—(3) cm longa, 1—2 (2½) mm lata; pedicelli terminales 3—4 mm longi, pedicelli laterales 1 mm longi, pedicelli summi 2 mm longi; calyx 2½ mm longus; petala 3—3¼ mm longa.

Paphlagonia: inter oppida Changri et Tukht, copiosissime in collibus stepposis, solo gypsaceo (una cum *Andropogone Ischaemo*) alt. ca. 1000 m (11. VII. — No. 196)[1]).

This beautiful species, bearing my husband's name, deserves to be introduced as an ornamental plant. — It is easily distinguished from the related *Gypsophila eriocalyx* Boiss. and *G. lepidioides* Boiss. by its tall stem, large panicles and the character of the indumentum: thick spreading hairs covering the peduncles and the calyces.

*Silene compacta* Horn. — Paphlagonia: in lateribus septentrionalibus jugi Ilgaz-Dagh, in praerupto viali, ca. 1250 m (28. VII. — No. 379). Prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere austro-orientali vallis Chamkeui-Su, inter fruticeta *Quercuum* in locis nudis inter scoria (romanae fodinae derelictae), ca. 850 m (31. VII. — No. 397).

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1) Subsequently (1929) collected in the vicinity of Changri (Čankri) also by Bornmüller (see 13, p. 104).

*Silene dichotoma* Ehrh. — Circa Byzantium: supra pagum Sari-Yar, in graminosis (12. VI. — No. 41). — Bithynia: circa Hendek, in latere vallis Ulu-Dere, in querceto, passim gregatim, ca. 500 m (24. VI. — No. 69).

*Silene inflata* Sm. — Circa Byzantium: supra pagum Sari-Yar, in graminosis, rara (12. VI. — No. 48). — Paphlagonia: supra oppidulum Tukht, in abieteto montis Panair-Tepe, ca. 1900 m (14. VII. — No. 256). In abieteto montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 1940 m (26. VII. — No. 541).

*Silene italica* L. — Paphlagonia: supra oppidulum Tukht, in abieteto montis Panair-Tepe, ca. 1900 m (14. VII. — No. 257).

*Minuartia erythrosepala* (Boiss.) Hand.-Mzt. — Ann. K. K. Hofmus. Wien, XXVI, 1912, p. 148. — Paphlagonia: in cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m (26. VII. — No. 542); in cacumine montis Büyük-Ilgaz-Dagh, ca. 2500 m (24. VII. — No. 342).

*Arenaria Ledebouriana* Fenzl β *glutinosa* Boiss. — Galatia: inter Angora et Kaledjik, in transitu montium inter fluvios Sakaria et Kizyl-Irmak, in stepposis, ca. 1300 m (10. VII. — No. 189). — Paphlagonia: supra oppidulum Tukht, loco Chirchir-Bunar dicto, in declivitate collium stepposorum, ca. 1550 m (12. VII. — No. 216).

*Stellaria Holostea* L. — Paphlagonia: supra oppidulum Tukht, in abieteto montis Panair-Tepe, ca. 1900 m (14. VII. — No. 250).

*Herniaria incana* Lam. — Galatia: circa Angora, in collibus trachyticis ad orientem urbis, in stepposis saxosis, satis frequens, ca. 1200 m (5. VII. — No. 165). Supra oppidulum Arab, in latere vallis Yaila-Chai (mons Eldiven-Dagh), solo serpentinico, ca. 1400 m (18. VII. — No. 544).

*Paronychia chionaea* Boiss. — Diagn. pl. or. nov. vol. I, fasc. 3, 1843, p. 9. — Paphlagonia: prope Kastamuni, in collibus calcareis, in stepposis, ca. 900 m (29. VII. — No. 433).

***Paronychia anatolica*** Czeczott (Pl. XXX, Fig. 1) — l. c. p. 31.

Sectio: *Anoplonychia* Fenzl — Boiss. Fl. Or. I, p. 743.

Humilis, suffrutescens, e caule crassiusculo, subterraneo caudiculos caespitosos, basi lignosos, procumbentes edens. Caules adscendentes, subangulati, patule puberuli, steriles breves, dense foliosi, floriferi longiores (3—4 ½ cm longi), sparsius foliati. Folia laete viridia vel glaucescentia, crassiuscula, obtusiuscula, ovata vel lanceolato-ovata, utrinque vel margine tantum hirsuta, subtus obsolete carinata.

Stipulae oblongo-lineares, acutae, folia subaequantes. Capitula mediocria (8—15 mm lata), subsessilia, precipue ad ramorum apicem coarctata. Bracteae ovato-rotundatae, vix acuminatae vel falcatae, flores multo superantes. Calycis laciniae 2,5—3 mm longae, inter se subaequales, ovato-lanceolatae, acutiusculae, adpresse puberulae vel glabriusculae, margine membranaceo ciliatae, apiculatae, perspicue trinerviae. Calyx fructu sesquilongior.

Galatia: supra oppidulum Arab, in declivibus rupestribus (serpentinicis?) vallis Yaila-Chai (mons Eldiven-Dagh), ca. 1400 m (18. VII. — No. 438). — Paphlagonia: supra oppidulum Tukht, in montosis stepposis loco Chirchir-Bunar dicto, ca. 1550 m (13. VII. — No. 437). Inter oppidum Changri et pagum Inekeui (ad fl. Devrez-Chai), in declivibus stepposis montis Akhlat-Dagh, ca. 1368 m (20. VII. — No. 545, Pl. XXX, Fig. 1).

From *Paronychia cephalotes* Bess. our plant differs by the sterile shoots being shorter, by the smaller capitula, narrower bracts and smaller laciniae of the calyx; from *P. chionea* Boiss. — by more slender shoots, smaller and more hairy leaves, which are of a light or vivid green colour, smaller capitula, narrower, prominently nerved, somewhat acute laciniae of calyx etc. From *P. capitata* Lam. and *P. macrosepala* Boiss. it is easily distinguished by the laciniae of equal (or almost so) length.

I do not feel quite certain whether this *Paronychia* really represents a new species. The great number of wrongly determined specimens originating from Anatolia, which I have seen in the Western-European herbaria, creates confusion difficult to overcome.

It seems, that, though widely distributed in Mediterranean countries, *P. Kapela* Kerner and *P. capitata* Lam. do not reach Anatolia (yet perhaps the latter species appears in its north-western corner?). *P. cephalotes* Bess., peculiar to the northern part of the Balkan Peninsula, Southern Russia and Caucasus, is present also in Armenia and may be extends its range to a part of Northern Anatolia[1]). *P. chionea* Boiss. and *P. kurdica* Boiss. appear to have the widest distribution in Asia Minor, the former occupying the more westerly,

[1]) Yet No. 3947 of Sintenis from Paphlagonia (Tossia, under *P. cephalotes*) is not *P. cephalotes*: a part of the specimens under this number represent *P. kurdica* Boiss., another part probably the above described species. No. 1063 of Bornmüller (Amasia, under *P. capitata* Lam.) and No. 655 of Manissadjian (Ak-Dagh near Amasia, under *P. capitata* Koch, non Lam.) perhaps may be related to *P. anatolica* Cz. also.

the latter the more easterly part of Asia Minor. More isolated montain-cones and chains are localities for several species with more restricted distribution. As instances may be named *P. caespitosa* Stapf and *P. argyroloba* Stapf, restricted to Phrygia, *P. Torgesiana* Hausskn. from Turkish Armenia, *P. Beauverdii* Cz. from Northern Galatia, and *P. anatolica* Cz. from Galatia and Paphlagonia.

***Paronychia Beauverdii*** Czeczott (Pl. XXX, Fig. 2) — l. c. p. 34.

Sectio: *Anoplonychia* Fenzl. — Boiss., Fl. Or. I, p. 743.

Perennis, suffrutescens. Caules 7 cm alti, numerosi, indurati, erecti, nudi, ramos breves, 1—2 cm longos, foliosos, paucos floriferos et numeriosiores steriles edentes. Folia saturate viridia, elongato-lanceolata, basi attenuata, acutiuscula, pilis sparsis adpressis obsita vel glabriuscula, margine regulariter oblique hirsuta, subtus carinata. Stipulae lineari-lanceolatae, acutae, folia inferiora aequantes, folia superiora superantes. Capitula subsessilia, pauciflora, paula, 8 ad 10 mm lata. Bracteae oblique oblongae, acuminatae vel falcatae, flores duplo superantes. Calycis laciniae 2—2½ mm longae, inter se subaequales, ovato-lanceolatae, acutae, perspicue trinerviae, anguste marginatae, margine bene ciliolato, apice penicellatae vel apiculatae, fructificationis tempore subrecurvae, fructu sesquilongiores.

Galatia: supra oppidulum Arab, in graminosis siccis ad latera meridionalia montis Eldiven-Dagh, substrato serpentinico, alt. ca. 1300 m (17. VII. — No. 440).

Described from a unique specimen. Easily distinguished from all other species of the section by erect naked caudicles.

*Paronychia kurdica* Boiss. — Galatia: supra Angora, in stepposis saxosis collium trychyticorum ad orientem urbis, ca. 1200 m (5. VII. — No. 160).

### *Tamaricaceae.*

*Tamarix parviflora* DC.? — Bithynia: inter Ada-Bazar et Hendek, in margine viae, in valle palustri Mudurlu, locis humidis (23. VI. — No. 55).

The identification of the specimens is uncertain on account of the total lack of flowers and fruits.

### *Guttiferae.*

*Hypericum Androsaemum* L. — Bithynia: circa Hendek, in valle Ulu-Dere, in alveo rivuli, rarius, ca. 300 m, fr. (26. VI. — No. 120).

Prope pagum Bichki-Dere (jugum Kurmaly-Dagh), in alveo torrentis, ca. 300 m, fr. (30. VI. — No. 581). — Paphlagonia: inter *Fagos* frutescentes ad viam a Küre ad Ineboli ducentem, ca. 1000 m (7. VIII. — No. 567).

*Hypericum calycinum* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia, alt. 60—800 m, fol. (25. I. — No. 726); ibidem, in macchia et apertis declivibus versus Bosporum, passim gregatim, fl. (12. VI. — No. 22); ibidem, supra pagum Rumeli-Kavak, in macchia, fr. (16. VIII. — No. 479). — Bithynia: circa Hendek, in valle Ibrik-Dere, fol. (1. II. — No. 715); ibidem, in valle Ulu-Dere, in fruticetis silvae mixtae juxta rivulum, ca. 370 m, fl. (29. VI. — No. 50).

*Hypericum scabrum* L. — Paphlagonia: supra oppidulum Tukht, in loco Armutly-Yelik dicto, in arduis parietibus angustiarum, in rupellis, ca. 1350 m, fl. (13. VII. — No. 241).

*Hypericum polygonifolium* Rupr. var. (nov.) ***paphlagonicum*** Czeczott[1]). — Caulibus tenuibus numerosis, sterilibus procumbentibus, elongatis (ad 30 cm longis), floriferis adscendentibus, brevioribus (5—20 cm longis), internodiis approximatis (saepe longitudinem foliorum aequantibus); foliis anguste oblongis, margine revolutis, rarius planis, pellucido-punctatis, supremis pellucido-striatis; cymis paucifloris (1—3), breviter pedunculatis, sepalis ovato-lanceolatis, eglandulosis (rarissime 1—2 glandulis instructis), corolla, extus intense rubescente, 3-plo brevioribus.

Paphlagonia: supra oppidulum Tukht, in fruticetis humilis *Juniperi nanae*, regione subalpina montis sine nomine (prope Panair-Tepe), ca. 1800 m (14. VII. — No. 251). In regione alpina montis Büyük-Ilgaz-Dagh, alt. ca. 2300—2500 m (24. VII. — No. 351); sub cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2300 m (26. VII. — No. 427).

I place here also the Paphlagonian specimens of Sintenis from "Tossia, Mt. Bellowa, in pratis subalpinis" (It. Or. No. 4597, 1892, sub *H. repente* L., det. Freyn).

This pretty plant (which I supposed at first to be *H. repens* L.) is certainly to be referred to the cycle of forms constituting the

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[1]) Beginning with this all specimens of *Hypericum* collected by me have been kindly revised by Prof. Keller and one of them — *H. alpestre* Stev. — also by J. N. Woronow. — According to the latter the name *H. repens* L. is to be rejected (Fl. cauc. crit., fasc. 13, p. 34).

complex species *Hypericum perplexum* Woronow (Guttiferae, Fl. cauc. crit, fasc. 13, 1906, p. 33). It is less obvious to me whether it is a parallel form equal to ssp. *Hypericum polygonifolium* Rupr., *H. alpestre* Stev. and *H. karsianum* Woronow (l. c. p. 40), or a variety of the first or second. On the ground of the similarity of the sepals I refer it temporarily to *H. polygonifolium* Rupr., which is, however, known to me from the description only.

*Hypericum alpestre* Stev. — Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in declivi et in cacumine (pineto circumdato) montis Khadji-Aghach, alt. 1400—1600 m (1. VIII. — No. 426).

Noticing the striking resemblance of my specimens to the Crimean *Hypericum tauricum* R. Keller ined. (Callier, It. tauric. 1900. No. 565) I submitted them to the revision of Prof. R. Keller and J. N. Woronow. The former communicated me the following: "Eine der zahlreichen Formen des *H. hyssopifolium* . . . Ich würde übrigens heute nicht anstehen *H. tauricum* dem nahestehenden *H. hyssopifolium* als var. einzureihen." The latter has confirmed my determination, with the difference, however, that he considers *H. tauricum* as the synonym of *H. alpestre* Stev. In this way the flora of the Crimea has been deprived of one more endemic species.

*Hypericum perforatum* L. — Circa Byzantium: supra pagum Sari-Yar, in margine et apertissimis locis macchiae, fl. (12. VI. — No. 16).

*Hypericum origanifolium* Willd. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in collibus saxosis (arenaceis), in stepposis, ca. 1550 m, fl. (14. VII. — No. 225).

*Hypericum bithynicum* Boiss. var. *foliis maioribus* Herb. Boiss. — Bithynia: circa Hendek, in silva mixta (*Fagus, Carpinus, Tilia argentea*), in declivitate meridio-orientali montis Yilman (vallis Ulu-Dere), ca. 560 m, deflorescens (25. VI. — No. 89).

*Hypericum Montbretii* Spach. — Bithynia: circa Hendek, in valle Su-Atak-Dere, satis rarum, deflorescens (26. VI. — No. 103).

Prof. Keller notes that it is: „Schmalblätterige Abänderung der *Montbretii*, der var. *athoum* Boiss. ähnlich."

## *Malvaceae.*

***Althaea*** (*Alcea*) ***rugoso-stellulata*** Czeczott (Pl. XXXI, Fig. 2a, 2b) — l. c. p. 35.

Series § 2 *Pterocarpae* — Boiss., Fl. Or. I, p. 831.

Elata, puberulo-scabrida, caule inferne glabro, virescente, superne gradatim griseo, petioli pedunculique pube stellulata plus minus parce obsiti: folia longe petiolata, breviter vel ultra medium obtusiuscule lobata, irregulariter crenulato-dentata, nervis subtus prominulis, utrinque pube stellata sparsim scabriuscula, floralia breviter ovata, triloba: flores solitarii, pedunculis inferioribus calyce subaequilongis, involucris calyce subduplo brevioribus, lobis triangularibus; calyces lobis ovato-lanceolatis, secus lineas et margines pilis stellulatis, longioribus obsitis: petala retusa emarginatave alba, fauce flavida, latitudine sua longiora; carpella dorso hirsuta, facie glabriuscula vel parce tomentosa, alis creberrime rugosis; semina dorso dense albo-pustulato.

Dimensiones: involucra 5—10 mm longa, 3—5 mm lata; calyces 16—20 mm longi, 5—9 mm lati; pedunculi 5—20 mm longi.

Galatia: inter Changri et Kaledjik, in stepposis (10. VII. — No. 175).

Related to *Althaea denudata* Boiss. and *A. Hohenackeri* Boiss. From the former it differs by the leaves being more profoundly (deeply) lobate, by the longer peduncles of its flowers, by white flowers (not intensely violet) and the pustulose (not puberulus) seeds: from the latter — by its sparse and shortly stellate indumentum, by the dimensions of petals and by the character of the carpels, which are more rugose.

## *Tiliaceae.*

*Tilia tomentosa* Moench (= *T. argentea* Desf.). — Hegi, Ill. Fl. v. Mitt.-Eur., Bd. V, 1, p. 434. — Bithynia: circa Hendek, in declivitate meridionali montis Ohlamurluk (vallis Ulu-Dere), arbusculae vel arbores ca. 12 m altae querceto admixtae, ca. 475 m, fl. (24. VI. — No. 75); ibidem, in declivi austro-orientali montis Yilman (vallis Ulu-Dere), in consortio *Fagi* et *Carpini* querceto admixta, ca. 450 m, fl. (25. VI. — No. 85 et 85 bis).

This species has a very limited and interesting distribution in Asia Minor: from Bithynia it extends to Western Paphlagonia (Ulu-Chai, between Karabuk et Yenidje, Markgraf 45, p. 367), and it reappears again, after a gap formed by the whole of Central Anatolia, in the eastern part of the Amanus mts. (near Bagtche, Siehe 72, p. 91; Post 59, p. 248).

### *Linaceae.*

*Linum hirsutum* L. var. *stenophyllum* Boiss. f. (nov.) ***albiflorum*** Czeczott. — Paphlagonia: inter Tukht et Changri, in stepposis, ca. 1000 m, fl. (15. VII. — No. 568).

*Linum tenuifolium* L. — Paphlagonia: supra oppidulum Tukht, loco Chirchir-Bunar dicto, in collibus stepposis. ca. 1550 m, frequens, fl. (14. VII. — No. 219).

### *Oxalidaceae.*

*Oxalis Acetosella* L. — Paphlagonia: in declivitate boreali montis Büyük-Ilgaz-Dagh. in abieteto umbroso. passim gregatim. ca. 1700 m (28. VII. — Non lecta).

Boissier does not mention this species for Asia Minor and its occurrence in that peninsula is not given in any European "Flora". yet it exists probably throughout the Northern Anatolia, for Endriss records it from the Kodja-Ili Peninsula in Bithynia (19, p. 405). Handel-Mazzetti from near Trapezunt in Pontus mts. (29. p. 159).

### *Geraniaceae.*

*Geranium asphodeloides* Willd. — Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in silva mixta, ca. 1350 m, deflorescens (5. VIII. — No. 444).

Intermediate form between the varieties α *genuinum* Boiss. and β *hispidum* Boiss.

*Geranium pyrenaicum* Burm. — R. Knuth, Geraniaceae in Engler, Das Pflanzenreich IV. 129, p. 152. — Paphlagonia: prope pagum Yailadjik (vallis Ilgaz-Su), sub fruticibus *Berberidis, Rosae, Juniperi, Cotoneastri*, ca. 1100 m, rarius, fl. (25. VII. — No. 370).

*Geranium Robertianum* L. — Bithynia: circa Hendek, in montibus Kurt-Dagh (Cham-Dagh), in locis humidis in glarea riparia in valle Isak-Oglu-Dere, ca. 250 m. fol. (11. II. — No. 776).

*Erodium cicutarium* (L.) L'Hér. f. *praecox* (Cav.) DC. — Knuth, l. c. p. 277. — Ins. Prinkipo: in cacumine aperto inter scopulos quarciticos. fl. (26. II. — No. 796).

### *Zygophyllaceae.*

*Peganum Harmala* L. — Galatia: Angora, in declivi montis cui arx imposita, inter ruinas aedificiorum. in ruderatis, gregatim (7. VI. — Non lectum). — Paphlagonia: supra pagum Inekeui (ad flumen

Devrez-Chai), in declivitate ardua, saxosa montis, prope antra, una cum *Pistacia mutica* et *Paliuro aculeato*, parce, ca. 900 m (21. VII. — No. 569).

### *Aceraceae.*

*Acer Pseudoplatanus* L. — Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in silva mixta (*Abies, Fagus, Taxus, Carpinus*), satis abunde, ca. 1350 m, fol. (5. VIII. — No. 449).

*Acer platanoides* L. — Paphlagonia: supra oppidulum Küre, in declivitate montium ad orientem vergente, in consortio arbuscularum *Populi tremulae*, *Pini nigrae* et *Pini armenae* etc., ca. 1250 m (5. VIII. — No. 456).

*Acer campestre* L. — Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in silva mixta (*Abies, Fagus, Taxus, Carpinus*), ca. 1350 m, fol. (5. VIII. — No. 443).

*Acer campestre* L. β *lobatum* Pax f. *molle* Opiz. — F. Pax, Aceraceae p. 55 in Engler, Das Pflanzenreich, H. 8, IV, 1902, p. 163. — Paphlagonia: supra Edjevid, in limite agrorum, ca. 1180 m, fr. (6. VIII. — No. 467).

*Acer hyrcanum* Fisch. et Mey. — Paphlagonia: in jugo Ilgaz-Dagh, in ardua declivitate boreali montis versus viam a Changri ad Kastamuni ducentem, arbusculae frutescentes, ca. 1500 m, fr. (24. VII. — No. 358).

### *Staphyleaceae.*

*Staphylea pinnata* L. — Bithynia: circa Hendek, arbuscula rara (4—5 m alta) in silva mixta (*Fagus, Quercus, Carpinus*) supra fundum vallis Su-Atak-Dere, ca. 475 m, fr. (24. VI. — No. 82).

### *Anacardiaceae.*

*Rhus Coriaria* L. (Turkish: Tetyr). — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere meridio-orientali vallis Chamkeui-Su, densa fruticeta inter *Quercus* frutescentes, ca. 850 m, fl. (31. VII. — No. 398).

This plant is used by the natives to obtain a brown dye-staff.

*Pistacia Terebinthus* L. — Circa Byzantium: inter pagos Sari-Yar et Rumeli-Kavak, in macchia juxta viam, frequentior, fol. (12. VI. — No. 4).

*Pistacia palaestina* Boiss. — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), inter fruticeta *Quercuum* et *Rhois*

*Coriariae* in latere meridio-orientali vallis Chamkeui-Su, ca. 850 m, rara, fol. (31. VII. — No. 570).

*Pistacia mutica* Fisch. et Mey. — Paphlagonia: supra pagum Inekeui (ad flumen Devrez-Chai), in fissuris saxorum conglomeratorum prope antra, ca. 900 m, solitarie, fr. (21. VII. — No. 316). Inter Tashköprü et pagum Kuru-Chai, in montosis supra vallem Geuk-Irmak, aliquot arbores juxta viam, etiam in limitibus agrorum cultorum, fol. (30. VII. — No. 388). Prope Ineboli, in macchia (8. VIII. — No. 934).

## Celestraceae.

*Evonymus europaea* L. — Paphlagonia: inter Tashköprü et pagum Kuru-Chai, in valle Geuk-Irmak, inter agros cultos, ad fossam irrigatoriam, ca. 700 m, fr. (30. VII. — No. 387).

*Evonymus latifolia* Mill. — Bithynia: circa Hendek, in fruticetis *Rhododendri* ad rivulum in valle Ulu-Dere, ca. 370 m, fr. (23. VI. — No. 60). — Galatia: supra oppidulum Arab, in latere occidentali vallis Yaila-Chai (mons Eldiven-Dagh), ad rivulum, 5-metrica arbor, ca. 1400 m, fr. (18. VII. — No. 299).

## Rhamnaceae.

*Paliurus aculeatus* Lam. (= *P. Spina-Christi* Mill.). — Bithynia: circa Hendek, in radicibus montis Cham-Dagh, in fruticetis, rami foliis destituti (31. I. — No. 773); ibidem, densa fruticeta in collibus constituens, ca. 150 m, fl. et fr. (23. VI. — No. 54). — Paphlagonia: supra pagum Inekeui (ad flumen Devrez-Chai), in declivi saxorum conglomeratorum, prope antra, una cum *Pistacia mutica*, ca. 900 m, fr. (21. VII. — No. 582). In valle rivuli Kuru-Chai (inter Sinopen et Tashköprü), in loco aperto inter frutices *Ostryae carpinifoliae*, passim gregatim, fr. (3. VIII. — No. 571 et 571 bis).

*Rhamnus Frangula* L. — Galatia: supra oppidulum Arab, in valle Yaila-Chai (mons Eldiven-Dagh), in fruticetis ripariis, ca. 1250 m, fr. et fl. (16. VII. — No. 311).

## Leguminosae.

*Lupinus albus* L. — Circa Byzantium: supra pagum Sari-Yar, in collinis in horto, passim copiose, fr. An spontaneus? (12. VI. — No. 40).

*Calycotome villosa* Vahl. — Circa Byzantium: supra pagum Sari-Yar, in collibus in macchia, rarior, fr. (12. VI. — No. 46).

*Spartium junceum* L. — Circa Byzantium: supra pagum Sari-Yar, in collibus in macchia, certis locis gregatim, fl. (12.VI. — No. 17). — Paphlagonia: supra oppidulum Ineboli, in declivitate praerupta versus mare vergente, ca. 540 m (7. VIII. — Non lectum).

*Genista Jauberti* Spach. — Galatia: inter Angora et Changri, in stepposis prope aedificia, frutex ca. ½ m altus, ca. 750 m, fl. (10. VII. — No. 177).

*Genista tinctoria* L. var. *mantica* Wohlf.? (= *Genista mantica* Pall.). — C. K. Schneider, Handb. d. Laubholzkunde II. 1912. p. 34. — Circa Byzantium: supra pagum Rumeli-Kavak, in macchia juxta viam, certis locis gregatim, fl. (12. VI. — No. 12).

My specimens match well, so far as the leaves are concerned, the picture in Reichenbach, Deutschlands Flora, p. 37, fig. IV, but the flowers in my specimens are much larger. I have not seen any authentic materials of this variety.

*Genista patula* M. B.? — Bithynia: circa Hendek, in declivitate montis Salman-Tepe (Cham-Dagh), in silva mixta (*Quercus, Fagus, Carpinus*), rami nudi tantum paucis foliis vestiti (6. II. — No. 562 bis); ibidem, in declivitate meridionali montis Ohlamurluk (vallis Ulu-Dere), in querceto, ca. 660 m, deflorescens, fr. imm. (24. VI. — No. 562).

I do not feel quite certain of the identification of my specimens because I have not seen any authentic material. A quite identical *Genista* has been collected by Bornmüller in "Bithynia: in regione media montis Keschisch-Dagh (Olympi) supra Brussa, 900 m" (No. 4263 sub *G. tinctoria* L. var.).

*Genista lydia* Boiss. — Bithynia: circa Hendek, in valle Ibrik-Dere, in rara silva mixta (*Fagus, Quercus, Carpinus*), una cum *Erica arborea* et *Arbuto Unedine*, ca. 450 m, rami nudi paucis foliis vestiti (10. II. — No. 700, f. *acuminata* Bornm. No. 700 bis?); ibidem, in declivitate meridionali montis Ohlamurluk (vallis Ulu-Dere), in querceto, ca. 430 m, fl. (24. VI. — No. 564 et 580).

*Cytisus pygmaeus* Willd. (= *C. supinus* L. var. *pygmaeus* Briq. — Cyt. Alp. Marit. 1894. p. 176). — Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in nudo cacumine montis Khadji-Aghach pineto circumdato, ca. 1760 m, deflorescens et fructicans (1. VIII. — No. 408).

*Cytisus supinus* L. (subsp. *supinus* Briquet) var. (nov.) ***argyrotrichus*** Czeczott. — Suffrutex 25—35 cm altus, ramis lignosis ascendentibus, parte inferiore glabris, parte superiore patule pilosis. Rami juniores pilis albis longis dense vestiti. Foliola elliptica vel obovata, 11—18 mm longa, 6—9 mm lata, utrinque ± parce pilosa, margine densius patule pilosa. Calyx densissime, patule, argentee villosus: corolla lutea vexillo extus piloso. Legumen (junior) dense patuleque villosum.

Bithynia: circa Hendek, in declivitate montis Ohlamurluk (vallis Ulu-Dere). in querceto. ca. 500 m (24. VII. — No. 67).

From the related *Cytisus lasiosemius* Boiss. (*C. supinus* L. var. *lasiosemius* Briq. — l. c. p. 178) it differs by its higher stature and much denser and longer indumentum.

*Cytisus syriacus* Boiss. (= *C. monspessulanus* L. var. *syriacus* Briq. — l. c. p. 142). — Circa Byzantium: supra pagum Sari-Yar. in macchia, rarus? fl. (12. VI. — No. 23).

This occurrence is quite a remarkable one, for the only (three) known localities where this *Cytisus* has been found. are situated in the Lebanon mts. Thus Boissier cites it from near Hammana and Solima, Bornmüller's specimens (No. 322, 1895) originate from "Libani, ad radices jugi Sanin . . . 1500—1600 m."

*Ononis hircina* var. *spinoso-hircina* Šir.[1]). — Paphlagonia: inter Küre et Edjevid. in declivitate boreali montis Kush-Tepe, in depasto pratulo in silva, ca. 1350 m, fl. (5. VIII. — No. 578). "ad *O. spinosa* ssp. *leiosperma* var. *tomentosa* Boiss. spectans".

*Ononis spinosa* L. subsp. *leiosperma* (Boiss.) Šir. var. *genuina* Šir[1]). — Paphlagonia: prope pagum Yailadjik (vallis Ilgaz-Su). in vervacto, ca. 1100 m, fl. (23. VII. — No. 326).

*Trifolium armenium* Willd. — Paphlagonia: supra oppidulum Tukht, in cacumine montis sine nomine (prope montem Panair-Tepe), *Junipero nana* vestito, ca. 1800 m, frequens, fl. (14. VII. — No. 263). In declivitate meridio-orientali montis Büyük-Ilgaz-Dagh. in pineto, passim gregatim, ca. 1800 m, fl. (24. VII. — No. 590); ibidem, in declivitate orientali contra montem Büyük-Ilgaz-Dagh (a laeva viae ad Kastamuni ducentis). in pineto. ca. 1700 m. fl. (28. VII. — No. 593).

*Trifolium arvense* L. — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü). in latere meridio-orientali vallis Chamkeui-

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[1]) Determined G. J. Širjaev.

Su, in abruptis saxosis et scoriosis inter fruticeta *Pinorum* et *Quercuum*, ca. 850 m, fl. (31. VII. — No. 401).

*Trifolium angustifolium* L. — Circa Byzantium: supra pagum Sari-Yar, in locis apertis macchia destitutis, certis locis frequens, fr. (12. VI. — No. 6).

*Trifolium purpureum* Loisel. — Circa Byzantium: supra pagum Sari-Yar, in margine macchiae juxta viam, ca. 150 m, deflorescens (12. VI. — No. 1).

*Trifolium uniflorum* L. — Circa Byzantium: supra pagum Sari-Yar, in praerupto juxta viam, fl. (2. III. — No. 705).

*Trifolium rivulare* Boiss. — Calycis dentibus tota longitudine ciliatis. — Paphlagonia: in declivitate orientali contra montem Büyük-Ilgaz-Dagh (a laeva viae ad Kastamuni ducentis), in pratis subalpinis ad limitem pineti rari, ca. 1700 m, fl. (28. VII. — No. 587).

*Dorycnium latifolium* Willd. — Circa Byzantium: supra pagum Sari-Yar, in macchia, rarum, fol. (25. I. — No. 822); ibidem, in collinis versus Bosporum, in macchia, frequentissimum, fl. (12. VI. — No. 15). — Bithynia: circa Hendek, in latere aperto vallis Ibrik-Dere, in fageto, ca. 350 m, fol. (1. II. — No. 746); ibidem, in declivitate montis Salman-Tepe, in silva mixta (*Fagus*, *Quercus*, *Carpinus*), fol. fr. (6. II. — No. 767); ibidem, in declivitate meridionali montis Ohlamurluk (vallis Ulu-Dere), in querceto raro, alt. 400 ad 500 m, frequentior, fl. (24. VI. — No. 79 et 79 bis). — Paphlagonia: in declivitate orientali contra montem Büyük-Ilgaz-Dagh (a laeva viae ad Kastamuni ducentis), in pineto raro, ca. 1700 m, fl. (27. VII. — No. 572). Supra vicum Djazoglu (inter Sinopen et Tashköprü), in pineto montis Khadji-Aghach, ca. 1600 m, fl. (1. VIII. — No. 599). Inter Küre et Edjevid, in silva mixta montis Kush-Tepe, in pratulis, ca. 1350 m, fr. (5. VIII. — No. 583). Supra oppidulum Küre, in declivitate orientali montium, inter fruticeta *Cisti laurifolii* et *Pinorum*, ca. 1250 m, fr. (5. VIII. — No. 573).

*Dorycnium intermedium* Ledeb. (= *D. herbaceum* Vill. var. *intermedium* [Ledeb.] Rikli — Die Gattung *Dorycnium* Vill., Engl. Bot. Jahrb. XXXI, 1902, p. 355). — Paphlagonia: supra oppidulum Küre, in declivitate orientali montium, inter fruticeta *Cisti laurifolii* et *Pinorum* ca. 1250 m, fr. (5. VIII. — No. 457).

*Coronilla varia* L. — Bithynia: circa Hendek, in declivitate meridionali montis Ohlamurluk (vallis Ulu-Dere), in querceto raro, alt. 400—500 m, frequentior, fl. (24. VI. — No. 78).

*Psarolea bituminosa* L. — Circa Byzantium: supra pagum Sari-Yar, locis apertis in macchia, frequentissima, fl. (12. VI. — No. 20).

*Galega officinalis* L. — Bithynia: circa Hendek, in sicco alveo rivuli Isak-Oglu-Dere, rara, ca. 250 m, fl. (27. VI. — No. 129). — Paphlagonia: circa Edjevid, in limitibus agrorum, alt. 1100 ad 1150 m, frequentior, deflorescens (6. VIII. — No. 576).

*Colutea cilicica* Boiss. et Bal. — Paphlagonia: supra oppidulum Tukht, in declivitate orientali collium stepposorum, ca. 1300 m, fl. et fr. (11. VII. — No. 192 et 192 bis). Prope pagum Yailadjik (vallis Ilgaz-Su), in fruticetis raris *Rosae, Berberidis, Cotoneastri*, ca. 1130 m, fr. (23. VII. — No. 595, forma *melanotricha*); ibidem, supra pagum Yailadjik, in declivitate meridionali montium, ca. 1360 m, fl. et fr. imm. (27. VII. — No. 610 et 610 bis, forma *melanotricha*).

One finds great confusion in herbaria in the arrangement of specimens of *Colutea* which possess the calyx covered with black hairs. They are either identified with *C. melanocalyx* Boiss. et Bal. or considered as *C. arborescens* L. var. *melanotricha* Freyn.

The former species displays in the shape and hairiness of the calyx features which allow one to recognise its distinctness at once, and in distribution it is as yet known only from a few localities in Lycia and Pamphilia (Asia Minor).

All specimens of *Colutea* collected by me in Paphlagonia, as well as No. 23 of Callier from the Crimea (under *C. arborescens* L.), No. 3882 of Sintenis from Tossia and No. 36 of Manissadjian from Amasia (both under *C. arborescens* L. β *melanotricha* Fr. et Sint.), No. 2696 of Bornmüller from Mt. Logman near Amasia and his No. 3037 from Angora (under *C. melanocalyx* Boiss.) represent one and the same species — *C. cilicica* Boiss. et Bal.

It is distinguished from *C. arborescens* L. by the following features: 1. leaves 3—6 (7)-partite, not 3—5 (6), 2. vividly yellow flowers larger, with the wings strongly convolute towards their apices and markedly longer than the keel, exceeding it in length 3—5 mm (in *Colutea arborescens* they are either equal in length or exceed the keel only ½ mm). Also the nervation seems to be a little different from that in *C. arborescens*. 3. The slightly oblique, broadly campanulate calyx has triangular acute teeth, which are narrower and more abruptly attenuate than in *C. arborescens*. 4. The pods are longer and narrower, 4,4—7 cm in length, (2) 2,5—3 cm in breadth, when ripe of a pale straw colour with the shining surface,

and — as it seems — with a different venation than in *C. arborescens*. They are more attenuate, with the acumen directed downwards (Pl. XXVII, Fig. 3a). In *C. arborescens* the pods are dirty-yellowish or brown-yellowish, often tinted with violet; the acumen is either bent upwards or remains in the horizontal plane (Pl. XXVII, Fig. 3b). This last distinguishing feature is well seen on the ripe pods, but it may sometimes be observed also on quite young ones.

The presence of fuliginous hairs on the calyx of *Colutea* cannot — in my opinion — be considered as a decisive feature by itself in distinguishing and establishing species and varieties, for the dark-haired forms are present in *C. arborescens* L. and in *C. cilicica* Boiss. et Bal.[1]). As instances of the former may be mentioned specimens collected in the Balkan Peninsula by Adamović (Macedonia — a. 1903, Rhodope mts. — a. 1906), Stříbrný and Wagner (Stanimaka) — figuring in herbaria under *C. arborescens* and *C. melanocalyx*[2]). That they exist also in Western Europe is proved by the specimens of Martin from near Lyons in France (Herb. Nat. Hist. Mus. Vienna). The dark-haired forms of *Colutea cilicica* occur among the specimens collected by me in Paphlagonia, and have also been brought from Kurdistan by Handel-Mazzetti and Nábělek. Also one of the type-specimens of Boissier (Kotschy No. 98 "in pinetis ad Gülek Boghas") bears some fuliginous hairs on the inner and outer side of the calyces[3]).

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[1]) In Ascherson u. Graebner: Synopsis d. Mitteleurop. Flora, vol. LVI, 2. 1909, p. 731, *C. cilicica* Boiss. et Bal. is included in the collective species *C. arborescens* — as *C. arborescens* B. *Cilicica* A. u. G. Taking into consideration the taxonomic features given above and the independence of the area of *C. cilicica*, such a blending of the two is not justifiable.

[2]) C. K. Schneider regards them as intermediate forms between *C. arborescens* L. on the one hand, and *C. cilicica* Boiss. et Bal. and *C. melanocalyx* Boiss. on the other. He expresses the supposition that they constitute (together with black-haired forms mentioned by us from Northern Asia Minor) a species extending its area from Hungary and the south-eastern part of the Balkan Peninsula to Northern Asia Minor and Armenia (Ill. Handb. Laubholzk. II, 1906, p. 88). Aschers. u. Graebn. (l.c.), who oppose this view, are rather inclined to consider the forms referred to as a subspecies (*melanotricha*) of *Colutea cilicica*.

[3]) Schwarz (69, p. 236) also arrived at the conclusion that Freyn's var. *melanotricha* should be referred not to *Colutea arborescens* but to *C. cilicica*; however, the rank "form" would be more appropriate in this case than that of "variety", for no marked difference seems to exist in the distribution of the black- and white-haired forms: they occur promiscuously in Paphlagonia and probably elsewhere.

Lastly, it must be mentioned that *C. arborescens* L. exists without doubt in the western part of Asia Minor (No. 1203 of Balansa from near Ouchak in Phrygia). Perhaps it is present also in the Amanus mts. in Syria, for the example of Kotschy 42 from Beilan, placed with *C. arborescens* with a question mark by Boissier. corresponds in the shape of the fruits to this species (yet the leaves are extraordinary small). On the other hand some of the long-winged forms from Greece arouse suspicion of being closely related to *C. cilicica*.

***Astragalus ilgazensis*** Czeczott (Pl. XXVII, Fig. 1) — l. c. p. 35.

Sectio: XVII. *Dasyphyllium* — Bunge. Generis astragali species gerontogeae 1868, p. 48 — Boiss. Fl. Or. II, p. 208.

Radix crassa, caudiculos numerosos, adscendentes, tenues, foliorum vetustorum rudimentis vestitos, emittens. Pedunculi scapiformes, ad 22 cm longi, albo-tomentoso-villosi, apice nigro-villosi. capitulis densis, multifloris (ca. 25-floris), ovato-globosis. Folia 8—25-juga. juvenilia imbricatim foliata, densissime sericeo-villosa, adulta foliolis remotiusculis, patule molliter villosa. Foliola orbiculata, ellipsoidea vel elongato-ovata, apice retusa, 2—8 mm longa. 1.5—4 mm lata. Stipulae rachiti inferne adnatae. magnae (15 ad 20 mm longae), hyalinae, lanceolatae, alte connatae, margine, basi, apice et secus nervos medios longe hirsutae. Bracteae hyalinae. infimae obovato-lanceolatae, superiores lineari-lanceolatae, 10 ad 11 mm longae, 3—4 mm latae, margine albo-setulosae, dorso secus nervum pilis nigris, albis, fuliginosis obtecto. Flores sessiles. violaceo-rubescentes (ex sicco), corolla calycem multo superante. Calyx albo-longevillosus, facie inferiore plerumque pilis nigris striatim intermixtis, tubo tubuloso 7—8 mm longo. ca. 3 mm lato. dentibus subulatis, ca. 4 mm longis, plumosis. Corolla vexillo elongato-rhomboideo, ca. 20 mm longo, 6 mm lato, apice retuso, carinam (ca. 13 mm longam) et alas (ca. 15 mm longas) superante. Ovarium glabrum. uniloculare, pleio (15)-spermum, in stylum glabrum (ca. 9 mm longum) sensim attenuatum. Legumina?

Paphlagonia: infra cacumen Büyük-Ilgaz-Dagh, sparsim inter *Juniperi nanae* frutices depressos, ca. 2450 m, fl. (24. VII. — No. 339).

The description of this pretty new species has been done after one specimen only. eaten to such extent by goats that only younger leaves and two capitula (out of five) were left. Surely it will be requiring some rectifications and in case the presence of a glabrous unilocular pleiospermous ovary will be proved on richer material

in fruit the definition of the section *Dasyphyllium* will necessitate a modification.

My plant is related to the collective species *Astragalus eriophyllus* sensu J. Freyn (Ö. B. Z. XLI, No. 12, 1891, pp. 404, 405) and perhaps may be considered as one of its subspecies[1]).

***Astragalus Nabelekii*** Czeczott (Pl. XXVII, Fig. 4)[2]) — l. c. p. 36.

Sectio: XIX *Stereothrix* — Bunge l. c. p. 47.

Humilis, dense patule tomentosus, e collo indurato caules dense foliosos, pedunculum unicum (an semper?), caulibus longiorem, edens. Folia pari- vel imparipinnata, 4—11-juga, brevia (ad 18 ad 26 mm longa), foliolis approximatis, obovatis, obtusis. Stipulae herbaceae, elongato-triangulares, albo (raro nigro) pilosae, inter se paulo connatae. Capitula globosa, laxa, 9-flora. Bracteae ovato-acuminatae, virescenti-brunnescentes, albo-nigro patule tomentosae. Flores violacei, pedunculis brevissimis, nigro tomentosis. Calyx patule albo-hirsutus, dentibus anguste linearibus (3.5—4 mm longis), tubo late-tubuloso (8 mm longo, 3,5 mm lato), basi attenuato, multo brevioribus. Corolla vexillo breviter bilobo, ca. 18 mm longo, 6 mm lato, carinam (12 mm longam) et alas (14 mm longas) multo superante. Ovarium pilosiusculum (?), uniloculare, pleio (16)-spermum. Legumina?

Paphlagonia: in regione alpina (cacumine) montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m. Rarus? fl. (26. VII. — No. 494).

In habit this new species very much resembles *Astragalus leucothrix* Frey et Bornm. (sect. *Stereothrix*), which species is known from Amasia and from Tossia. The latter locality is situated in the same Ilgaz-Dagh mts. in which my new species has been found. I even supposed that Sintenis' specimens No. 4217, originating from Tossia, belonged to my new species. Yet closer analysis has shown that, on the one hand, No. 4217 is identical with No. 1840 of Bornmüller (*A. leucothrix* from Amasia), on the other, they both differ from my specimen by: 1) the kind of hairiness: *A. leucothrix* being setoso-hirsute, while my species is softly tomentose, 2) the

[1]) I am obliged for the indication of the systematic position of my plant to Prof. Bornmüller, who distributed the same plant (No. 14082), collected by him in the same chain of Ilgaz-Dagh in 1929, under the temporary name *A. eriophyllus* Boiss.

[2]) Named after Dr. Fr. Nábělek (Brno) who kindly determined several of my *Astragali* (marked with an asterisk).

character of the calyx: in *A. leucothrix* the teeth are as long or even longer than the tube, in *A. Nabelekii* — half as long as the tube, 3) the shape of the bracts: in *A. leucothrix* — narrow, almost linear and much exceeding the length of the tube, in *A. Nabelekii* — larger and hardly surpassing the tube.

*Astragalus glycyphyllus* L. var. *bosniacus* Beck. — Hayek, Prodr. Flor. penins. Balcan. I, 1927, p. 775. — Bithynia: circa Hendek, in latere meridio-orientali vallis Isak-Oglu-Dere, in querceto, ca. 350 m, rarus, deflorescens (27. VI. — No. 128).

**Astragalus piletocladus* Freyn et Sint. — J. Freyn, Plantae ex Asia Media. Bull. Herb. Boiss. IV, 2. ser., p. 1108. — Galatia: circa Angora, in collibus stepposis ad orientem urbis, solo trachytico, ca. 1200 m, fl. (5. VII. — No. 167).

*Astragalus megalacmus* Freyn et Sint. — J. Freyn, Plantae nov. orient. III, Ö. B. Z. XLIII, 1893, p. 419. — Paphlagonia: inter Tukht et Changri, in declivitate orientali collium stepposorum, in faucibus, ca. 1100 m, unicum exemplar, circ. 1 m altum, fl. (15. VII. — No. 268).

**Astragalus baibutensis* Bge. var. *macropetalus* Freyn et Bornm. — J. Freyn, Plantae nov. or. II, Ö. B. Z. XLII, 1892, p. 11. — Paphlagonia: supra oppidulum Tukht, in cacumine montis Panair-Tepe, inter plantas stepposas et silvestres in margine abieteti, ca. 1950 m, fl. (14. VII. — No. 495).

*Astragalus anthylloides* Lam. var. *villiger* Bornm.? — Paphlagonia: supra oppidulum Tukht, in montosis stepposis loco Chirchir-Bunar dicto, inter frutices *Quercuum*, ca. 1540 m, frequentior, fl. et fr. (12. VII. — No. 224).

I do not feel certain of this identification, for I have seen no specimen of the related *A. foliosus* Bge., which — according to the occurrences given in the Flora Orientalis (II, p. 403) — might be present in the region of the Ilgaz-Dagh chain and in the mountainous regions situated to the south of Devrez-Chai (Tukht!).

Our plant is quite similar to the example 3887 of Sintenis (under *A. anthylloides* DC., det. J. Freyn), and comes very near to specimens of Bornmüller representing his var. *villiger*. Both originate from Ilgaz-Dagh. The specimens of *A. anthylloides* from the classical localities — in Cappadocia and Armenia — differ from all three of the South-Paphlagonian ones referred to by: 1) the larger dimension of the whole plant, 2) more lax inflorescence and 3) leaves.

which are densely, silvery tomentous (in Paphlagonian specimens — grey and more or less sparsely pilous).

*Astragalus* sp. Sectio LXV *Onobrychium*. × × Vexillum glaberrimum. + + Calycis pubes adpresse. a) Humiles. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in collibus stepposis, substrato saxoso arenaceo, ca. 1550 m. fl. (14. VII. — No. 626).

This specimen may possibly be placed under *A. karamanicus* Boiss. et Bal. As I have not seen any reliable material of the latter species, I have left it undetermined.

**Astragalus Kotschianus* Boiss. var. *medicagineus* Boiss. — Paphlagonia: in regione pinetorum et abietetorum jugi Ilgaz-Dagh, in declivi viali ad orientem vergente, inter plantas stepposas, ca. 1450 m, fl. (24. VII. — No. 361).

**Astragalus mossulensis* Bge. out ei proximus. — Paphlagonia: inter Tukht at Changri, in collibus stepposis ad orientem vergentibus, ca. 1100 m, fl. (15. VII. — No. 493).

*Hedysarum varium* Willd. var. (nov.) ***pictum*** Czeczott. — Calycis dentibus lanceolato-subulatis tubo subaequilongis, alis et carina apicibus intense violaceis, ovario 3—4-ovulato.

Paphlagonia: supra oppidulum Tukht, in loco Armutly-Yelik dicto, ad radices montis Bokly-Tepe, in praerupto saxoso gregatim, ca. 1430 m, fl. (13. VII. — No. 240).

By the general aspect and especially by the character of the leaves my specimens agree very well with those collected by Balansa near Ouschak in Phrygia, from which specimens Boissier described his *Hedysarum phrygium* (= *H. varium* Willd. β *phrygium* Boiss.). This variety is probably widely distributed in Anatolia, for it has been collected in Ak-Dagh mts. near Amasia by Bornmüller (No. 111) and near Tossia by Sintenis (No. 4214)[1]. The example from the latter locality has 2—4 articulate pods, which is the case with my specimens also. Yet the violet coloration of the tops of the wings and keel induce me to make a new variety. The original diagnosis of *Hedysarum varium* Willd. has to be modified as concerns the character of legumen, which is not 2—3, but 2—4 articulated.

*Onobrychis armena* Boiss. et Huet[2]). — Galatia: supra oppidulum

[1]) Both determined by Freyn and revised by Fedtschenko. See "The survey of the species of the genus *Hedysarum*". Acta Hort. Petrop. XIX, 1902, p. 269.

[2]) The determinations of my specimens of *Onobrychis* has been kindly revised by G. I. Širjaev.

Arab. in latere boreali vallis Yaila-Chai (mons Eldiven-Dagh), in pineto, ca. 1350 m, frequentissima, fl. (18. VII — No. 294).

*Onobrychis cadmea* Boiss. — Paphlagonia: in declivitate meridionali montis Büyük-Ilgaz-Dagh, in pineto, ca. 2100 m, frequentissima, fl. (24. VII. — No. 352); in depasta declivitate meridionali montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 1500 m, fl. (26. VII. — No. 586); ibidem, in cacumine montis Kush-Kayasy, ca. 2400 m, fl. (26. VII. — No. 598).

*Onobrychis cornuta* (L.) Desvaux. — G. Širjaev, *Onobrychis* generis revisio critica I, 1925, p. 22. — Paphlagonia: in cacumine montis Büyük-Ilgaz-Dagh, ca. 2500 m, abunde, fl. (24. VII. — No. 347).

The presence of *O. cornuta* in Paphlagonia considerably changes the map of the distribution of this species as given by Širjaev (l. c. p. 23), adding to its area probably the whole of Northern Anatolia.

*Onobrychis hypargyrea* Boiss. f. β *spinuligera* Bornm. — Širjaev. l. c. II, p. 70. — Paphlagonia: inter Tukht et Changri. juxta viam et in limitibus agrorum, ca. 1100 m, fl. et fr. (15. VII. — No. 270).

*Alhagi camelorum* Fisch. — Galatia: inter Angora et Changri, circa aedificia in stepposis. ca. 750 m, fl. (10. VII. — No. 178).

*Vicia cassubica* L. — Bithynia: circa Hendek, in monte Yilman (vallis Ulu Dere), in pratulis querceti. passim gregatim, ca. 425 m, deflorescens (25. VI. — No. 699).

*Vicia tenuifolia* Roth ssp. *V. elegans* Guss. — Freyn, Bull. Herb. Boiss. III, 1895, p. 192. — Circa Byzantium: supra pagum Sari-Yar, in calcareis collibus apertis, macchia destitutis, passim gregatim, fl. (12. VI. — No. 13).

The same form was collected near Constantinople by Aucher-Eloy in 1833 (Herb. Kew — under *Vicia* sp.).

*Vicia tenuifolia* Roth. subsp. *V. variabilis* Freyn et Sint. β *virens* Freyn. — l. c. p. 193. — Paphlagonia: in declivitate meridio-orientali montis Büyük-Ilgaz-Dagh, in pineto combusto. ca. 1740 m. fl. (24. VII. — No. 328 et 577); ibidem. aperto loco pineti ad meridiem vergente. ca. 1800 m, unicum exemplar, fl. (24. VII. — No. 321).

My Paphlagonian specimens correspond to this variety in all their features save the colour of the flowers, which are — as in Freyn's varieties γ *stenantha* and δ *parviflora* (l. c. p. 193) — variegated (white and blue).

*Vicia Ervilia* (L.) Willd. — Paphlagonia: in montibus inter Changri et fl. Devrez-Chai, culta, ca. 1170 m, fr. (20. VII. — No. 574).

*Lathyrus undulatus* Boiss. — Bithynia: circa Hendek. in declivitate montis Ohlamurluk, in querceto, ca. 400 m, fl. et fr. (24. VI. — No. 64 et 64 bis).

There is no doubt that *Lathyrus undulatus* Boiss. and *Lathyrus rotundifolius* Willd. are two related species. Owing to their likeness, some of the specimens originating from near Constantinople have been wrongly considered to be *L. rotundifolius* (e. g. the specimens of Wiedemann and Dumont d'Urville). Yet every student of the distribution of these two species must feel doubt about the presence of *L. rotundifolius* Willd. in south-eastern part of Thrace[1]), for the latter species occupies the area from Northern Persia — through the Caucasian countries — to Turkish Armenia and eastern part of Pontus mts, on the one hand, and the Crimea — on the other. After the gap of the whole central part of Northern Anatolia, it reappears in the form of the related *Lathyrus undulatus* Boiss. in Bithynia and near Constantinople[2]).

Both species spoken of have been since long in cultivation in botanical gardens of Western Europe (probably from seeds brought by Sibthorp and Aucher-Eloy). According to Baker's observations, made on individuals in culture, *L. rotundifolius* Willd. is distinguished from *L. undulatus* Boiss. (known formerly under the name *L. Sibthorpii* Baker ex Hort.) by the following features: "It flowers a month later (in June) and differs from *Sibthorpii* by its more numerous brick-red flowers, denser racemes and shorter, more obtuse leaflets" (Gard. Chron., vol. 7, 1890, p. 704). *L. undulatus* Boiss. blossoms in April and Mai and its flowers are with "the petals mauve-red, fading to violet". — I can add that the leaflets of *L. undulatus* are dark green or yellowish green, considerably larger (4—6,5 cm in length and 1,5—4 cm in breadth) and very variable in the degree of undulation and in their shape — from ovate-lanceolate acuminate to ovate-orbicular blunted. The leaves of *L. rotundifolius* are, in the dried state, bluish green and although smaller yet relatively broader (3—5 cm in length, [1,5] 2—3,5 cm in breadth).

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[1]) Such a doubt has been expressed by Baker (Gard. Chron., vol. 7, 1890, p. 704) and Fritsch (Sitzb. Akad. Wiss. CV, 1896, p. 319). — At my request Prof. Fedtschenko revised the specimens of Wiedemann from Constantinople present in the Principal Botanical Garden Herbarium, Leningrad, and informed me that they represent *Lathyrus undulatus* Boiss.

[2]) See map of distribution of both the above mentioned species in: Czeczott, 18, p. 60, fig. 15.

Taking into consideration the taxonomic and distributional differences it would be wrong, in my opinion, to relegate *L. undulatus* Boiss. to *L. rotundifolius* Willd. as a variety, which is the tendency of some botanists[1]).

***Lathyrus tukhtensis*** Czeczott (Pl. XXXII. Fig. 2a, 2b) — l. c. p. 36[2]).

Sectio: *Orobus* — Taubert in Natürl. Pflanzenf. III. 3. 1894. p. 354.

Radix lignosa tenuis, longissima, serpentina, pluriceps, e collo caules dense foliatos steriles et unicum floriferum, sparsius foliatum, edens. Caules adscendentes angulati, glabriusculi vel parce puberuli. Folia 2- superiora unijuga, subdigitata; foliola rigidula, anguste linearia, 9—11-nervia (5 nervi subtus valde prominentes, caeteri ± obscuri), parce puberula vel glabra; stipulae rigidae, semihastatae, subulatae, petiolum latum, brevem, superantes. Pedunculi folia superantes, tenues, 5—9-flores; inflorescentia contractim racemosa, floribus paucis, pedicellatis; calyx viridis, superne violascens, venis dense anastomosantibus, tubo pedicello sublongiore, laciniis inaequalibus, superioribus brevioribus, oblique triangularibus, abrupte subulatis, sursum directis conniventibus, inferioribus anguste triangularibus, sensim subulatis, omnibus acutissimis, margine ciliolatis. Corolla violacea, unguibus calyce longioribus, vexilli lamina retusa, rotundata vel triangulari-rotundata; carina alis vix, vexillo manifeste brevior. Stylus apice sensim dilatatus, intus dense barbatus. Legumina linearia, glabra, apice non incurva (an semper?).

Dimensiones: radix ca 40 cm longa; caules floriferi 17—35 cm longi, caules steriles 10—15 cm longi; foliola 2,5—7 cm longa, 1,5—3 (5) lata; pedicelli 1—3 mm longi; calyx cum dentibus 6—6,5 mm longus, 2—2,5 mm latus; vexillum 18 mm longum, 11—13 mm latum; alae 16 mm, carina 15 mm longae.

Paphlagonia: supra oppidulum Tukht, in quercetis frutescentibus in montosis loco Chirchir-Bunar dicto, ca. 1500 m. fl. (13. VII. — No. 246).

I place here also the specimen of Sintenis from Turkish Armenia: "Erzinghan, Sipikordagh, in dumetis supra Sipikor". — It. or. a. 1889, sub *Orobo cyaneo* Stev. f. *bijuga*, det. Freyn.

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[1]) Bornmüller determined one of his specimens (No. 4977, Mudania) as "*Lathyrus undulatus* Boiss. (recteres *L. rotundifolius* L. β *undulatus* m.)".

[2]) Širjaev, G. in Bul. Ass. Russe Rech. Sc. Prague III/VIII, No. 18, 1936, p. 223.

From the related *Orobus cyaneus* Stev. and *O. sessilifolius* Sibth. et Sm. our plant differs by the parallel nervation of the leaves, the veins being not or inconspicuously anastomosing, by the smaller flowers and the character of the lobes of calyx (narrower, more acute, ciliate). Besides these it is distinguished from the former by the multiflorous inflorescence (5—9, instead of 2—4), from the latter — by the contracted inflorescence (instead of loose), the petioles being short yet longer than in *O. sessilifolius*. From *O. canescens* L. it differs by the subdigitate leaves, with 1—2 pairs of leaflets (instead of pinnate, 2—3-paired).

*Lathyrus inermis* Roch. β *glabriusculus* (Ser.) Hayek — Prodr. Flor. penins. Balcan. I, 1924, p. 819 — (= *Orobus hirsutus* L.). — Bithynia: circa Hendek, in declivitate meridionali montis Ohlamurluk (vallis Ulu-Dere), ca. 500 m, fl. (24. VI. — No. 584 et 584 bis).

***Lathyrus sericeus*** (Boiss. et Bal.) Czeczott, comb. nov. (= *Orobus sericeus* Boiss. et Bal.). — Paphlagonia: supra oppidulum Tukht. in abieteto montis Panair-Tepe, ca. 1900 m, fl. (14. VII. — No. 557). In declivitate boreali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m, fl. (28. VII. — No. 575).

*Lathyrus luteus* Peterm. b. *aureus* Beck. — Asch. u. Graebn., Synop. VI, 2, 1910, p. 1044 — (= *Orobus aureus* Stev.). — Bithynia: circa Hendek, in declivitate boreali montis Yilman (vallis Ulu-Dere), in fageto, ca. 450 m, rarus, fl. (25. VI. — No. 96).

***Goebelia Jauberti*** (Spach) Czeczott, comb. nov. (= *Sophora Jauberti* Spach — Illustrationes plantarum Orientalium IV (1850—1853), p. 43, tab. 330 = *Goebelia* (*Sophora*) *reticulata* Freyn et Sint. — Ö. B. Z. XLIV 1894, pp. 66, 98; Handel-Mazzetti 29, p. 168). — Bithynia: inter Ada-Bazar et Hendek, in depasta planitie vallis Sakaria, gregatim, fr. immat. (23. VI. — No. 59).

Owing probably to scarcity of material Boissier overlooked the specific distinctness of *Sophora Jauberti* Spach and put it as a synonym of *Goebelia alopecuroides* Bge.

When determining the *Goebelia* material collected in Bithynia I was struck by the glabrous upper surface of the leaflets, which are mucronulate, while in the description in Boissier, Flora Orientalis II, 1872, p. 629 we read: "adpresse hirta plus minus sericea . . . foliolis oblongis ellipticis obtusis . . ." Although I have not seen the type-specimen of Spach "ca Nicomediam, Bythinia, 1839", the description and the picture in "Illustrationes plantarum Orientalium" (l. c.) proved to me clearly that 1) *Sophora Jauberti* Spach was not

identical with *Goebelia alopecuroides* Bge., 2) my Bithynian specimens, those of Pestalozza and of Sintenis No. 3831 (It. or. a. 1892) "*Goebelia* (*Sophora*) *reticulata* Freyn et Sint. sp. nov." from Paphlagonia, matched very well the species of Spach. — Thus, following the International Rules of Botanical Nomenclature (Vienna, 1905, Chapt. III, Art. 15 ,p. 37) the name given by Freyn — *Goebelia* (*Sophora*) *reticulata* is to be considered as synonym of the older name — *Sophora Jauberti* Spach or, following Bunge (in Boissier, Fl. Or. II, p. 628) — of *Goebelia Jauberti* (Spach) Cz.[1])

The careful investigation of all available exsiccata of *Goebelia* in several Western European herbaria and some data taken from the literature of the subject led me to work out the distribution of this species, which proved to be quite different from the area occupied by the two other representatives of the genus *Goebelia*.

I refer to *Goebelia Jauberti* (Spach) Czeczott the following exsiccata and data from the literary sources:

"Dobrogea, distr. Tulcea. Ad margines silvarum et in cultis derelictis in "Poiana Chiurum Tarla" ad opp. Babadagh, solo arenoso-humoso. Alt. 100 m", 6. VI. 1922, No. 258, leg. Al. Borza, sub *Goebelia alopecuroide* (L.) Bunge[2]).

"Turcia". Constantinopel. Ad margines silvarum prope "Skoumroukey". 1901, No. 4223, leg. G. V. Aznavour, sub *Goebelia alopecuroide* (L.) Bge.

*Sophora* collected near Constantinople prior to Aznavour by Buxbaum. "in dumetis circa pagos ad Pontum Euxinum in Thracia" (724?) undoubtedly represents this species[3]).

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[1]) J. Prodan (60, p. 231) justly remarks: "Taubert hat sie (*Goebelia*) dann in Engler u. Prantl's Natürl. Pflanzenf. (III, 3, 195) als Untergattung zu der Gattung *Sophora* gestellt; da aber *Sophora* (Sect. *Eusophora* DC.) ein mucronates Schiffchen besitzt, *Goebelia* aber ein stumpfes, besteht zwischen diesen derselbe Unterschied wie zwischen *Oxytropis* und *Astragalus*, welche Taubert in dem genannten Werke etwas inkonsequent doch als Gattungen nebeneinander bestehen läßt. So lange wir also *Oxytropis* von *Astragalus* trennen, muß auch *Goebelia* neben *Sophora* bestehen."

[2]) *Goebelia* was first discovered in Dobruja in 1911 by Prodan and determined incorrectly by Degen, as *Goebelia alopecuroides* (L.) Bge. The discovery of this rare plant is described in an interesting paper by Prodan "Über die Entdeckung von *Goebelia alopecuroides* (L.) Bge. in Rumänien" (60, p. 230—235), which is in places inconsistent in concerning *G. alopecuroides*, while in reality another species of *Goebelia* is present there. — The occurrence of *G. Jauberti* (Spach) Cz. in Dobruja is still more remarkable in that it is not the sole representative of the mesophytic forest region of Northern Asia Minor: *Fagus orientalis* Lipsky is likewise said to be growing in the same district of Tulcea. (Grintescu, 26, p. 57.)

[3]) Cited after Prodan (l. c. p. 234). According to this author Aznavour refound the species in 1896 near the village of Küchük-Skumrukey. It is worth

"Bithynia" 1846, leg. Pestalozza, sub *G. alopecuroide* (L.) Bge. Pestalozza collected this species most probably on the same alluvial plains of the river Sakaria and its tributary Mudurlu, where I collected my specimens, because owing to the gregarious way of occurrence in this locality *Goebelia* must attract the attention of every botanist who, following the road from Ada-Bazar to Hendek and Bolu, crosses these plains.

"Circa Nicomediam, Bithynia", a. 1839, leg. Jaubert, sub *Sophora Jauberti* Spach. Type-specimen.

Bithynia: "Am Rande trockener *Rhododendron*-Gebüsche bei Bender Erekli (Heracleia), ca. 30 m", No. 105, leg. Handel-Mazzetti, sub *Sophora* (*Goebelia*) *reticulata* Freyn et Sint.

Near Zunguldak (Bithynia) it has been collected by Ali-Risa-Bey and Palibine. Mon. Jard. Bot. Tiflis, Liv. 50, 1920, p. 1—12. Under *Sophora reticulata* Freyn et Sint.

"Paphlagonia. Wilajet Kastambuli. Ineboli: in silvaticis ad monasterium", 30. VI. 1892, No. 3831, leg. Sintenis, det. Freyn as *Goebelia reticulata* Freyn et Sint.[1]).

In accordance with its mesophytic habit (glabrous leaflets) *Goebelia Jauberti* is to be found in Northern Anatolia, characterized by the humid climate, all occurrences being situated in the forest-region, more or less in the proximity of the Black Sea. The xeromorphic *Goebelia alopecuroides*[2]) occupies steppe-like Central Anatolia, reaching northwards to the more interior chains of Northern Anatolia, as for instance: near Geive in Bithynia (Wiedemann), the Ilgaz-Dagh in Paphlagonia (Sintenis, No. 4475, Tossia), near Amasia in Pontus mts. (Bornmüller, No. 113) and may even be near Samsun[3]). In this way the present known range of *Goebelia Jauberti* — extending from south-eastern Thrace to Paphlagonia — allows us to classify this species with the South Euxine element. It is worth noting that, up to now, it has not been found farther

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noting that both this locality and that given by Buxbaum are situated in a district, where many South-Euxine and Colchic species are to be found (viz. in the proximity of the Belgrad Forest).

[1]) I have not seen the specimens of "*G. alopecuroides*" from "Phrygia: prope Akhissar (Thyatira)" collected by Sibthorp, and from "Prope Bolu" — by Grisebach. (Both occurrences are in "Asie Mineure", Bot. I. 1860, p. 106, Tchihatcheff). The latter date, from its geographical position, might be relating to *G. Jauberti*.

[2]) General area: from Central Anatolia to Baluchistan, Tibet and the Altai mts. in Siberia. The third species of this genus, *Goebelia pachycarpa* C. A. Mey., inhabits the steppes and deserts of Persia, Turkestan and Songaria.

[3]) It seems to be a fact that along the course of rivers *Goebelia alopecuroides* reaches in places the coast of the Black Sea. Beside Samsun may be mentioned its occurrences at the mouth of the river Chorokh and Poti (Woronow 90, p. 14).

to the east along the coast of the Black Sea, and nobody has reported it from Colchis either[1]).

## *Rosaceae.*

*Prunus Mahaleb* L. (= *Cerasus Mahaleb* Mill.). — Galatia: supra oppidulum Arab, in aperto declivi depasto ad fontem rivuli Ai-Deressi, una cum *Berberide, Lonicera etrusca, Viburno Lantana* fruticeta rara constituens, substrato tufoso, ca. 1400 m (17. VII. — No. 292); ibidem, in valle Yaila-Chai (mons Eldiven-Dagh), prope rivulum in pineto, arbusculae et frutices 4—5 m alti, ca. 1400 m, fr. (18. VII. — No. 852).

*Prunus Laurocerasus* L. (= *Cerasus Laurocerasus* Lois.). — Bithynia: circa Hendek, in parte superiore vallis Ibrik-Dere, in silva mixta (*Quercus, Fagus, Carpinus, Castanea*) prope torrentem densa fruticeta, ad 3 m alta, constituens, ca. 450 m (31. I. — No. 727); ibidem, in valle Ulu-Dere, una cum *Rhododendro* fruticeta constituens, 400—450 m (3. II. — No. 739 et 739 bis); ibidem, fruticeta densa prope rivulum, ca. 400 m (23. VI. — No. 51 et 51 bis).

*Prunus divaricata* Ledeb. — Circa Byzantium: supra pagum Sari-Yar, in macchia juxta viam (2. III. — No. 110).

*Prunus avium* L. (= *Cerasus avium* Moench). — Paphlagonia: ad declivia borealia jugi Ilgaz-Dagh, in fruticetis *Fagorum*, una cum *Pinis nigris* solitariis, juxta viam a Changri ad Kastamuni ducentem, ca. 1500 m, fr. (28. VII. — Non lecta). Inter Küre et Edjevid, in declivitate montis Kush-Tepe, juxta viam in silva mixta excisa, ca. 1100 m (5. VIII. — Non lecta).

*Prunus domestica* L. — Paphlagonia: supra Edjevid, in declivi meridio-orientali collium, in limite agrorum cultorum, ca. 1150 m (6. VIII. — No. 470).

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[1]) In 1935, i. e. five years after the above notes had been written, appeared a note by Edgar Anderson "An endemic *Sophora* from Rumania" (3), in which this author described the Dobrujan *Sophora* (*Goebelia*) under a new specific name: *Sophora Prodanii* Anderson. The characters given by him (p. 78) distinguish it from *Sophora alopecuroides* and its variety *tomentosa*, but match to perfection, in my opinion, the specimens from Asia Minor and the vicinity of Constantinople (referred by different authors to *S. Jauberti* Spach or *S.* (*Goebelia*) *reticulata* Freyn et Sint.), as well as those from Dobruja distributed by Borza (mistaken for *S. alopecuroides*). The creation of a new name is therefore quite superfluous, and to the Dobrujan specimens should be applied the name of Spach — *S. Jaubertii*, which species has a range very similar to that of *Hypericum calycinum* (see Czeczott, 18, p. 60).

*Prunus armeniaca* L. (= *Armeniaca vulgaris* Lam.). — Ins. Prinkipo: in horto. fl. (26. II. — No. 797).

*Pirus communis* L. — Galatia: supra oppidulum Arab, in latere vallis Yaila-Chai (mons Eldiven-Dagh) ad occidentem vergente, una cum *Pinis*, ca. 1400 m (18. VII. — No. 312).

*Pirus elaeagrifolia* Pall. — Galatia: inter Ravly et Kaledjik, in latere vallis Amadil-Chai, juxta viam ab Angora ad Changri ducentem, arbores solitariae inter agros cultos, ca. 1100 m (10. VII. — No. 179). Inter Changri et pagum Yanarkeui (in radicibus montis Eldiven-Dagh situm), in densis fruticetis ad fluvium Yanar-Chai et ad fossam irrigatoriam, ca. 1000 m (16. VII. — No. 290). Supra oppidulum Arab, in convalle laterali vallis Yaila-Chai (mons Eldiven-Dagh) ad septentrionem vergente, spontaneis arboribus fructiferis abundante (*Prunus domestica, Pirus communis*), inter *Pinos nigras*, ca. 1300 m (17. VII. — No. 851). In declivitate austro-orientali montis Kush-Kayasy (jugum Ilgaz-Dagh), aliquot arbores in stepposis, ca. 1700 m (26. VII. — No. 900, Phot. 30).

My determinations have been verified by J. N. Woronow, the author of a valuable note on the wild pears (91, p. 7—11).

*Malus communis* Lam. — Paphlagonia: in valle Kuru-Chai (inter Sinopen et Tashköprü), in fruticetis *Corni maris, Quercus Cerris, Coryli Avellanae*, abunde (3. VIII. — Non lecta).

*Sorbus domestica* L. — Bithynia: circa Hendek, inter pagos Shekhlar et Ermeni-Djedjid, in declivitate meridionali montis Yildiz-Dagh (mons Cham-Dagh), in querceto frutescente, ca. 200 m (27. VI. — No. 113). — Paphlagonia: in pago Kuru-Chai (inter Sinopen et Tashköprü), in horto, ca. 750 m (3. VIII. — No. 416).

*Sorbus umbellata* Fritsch var. b. *cretica* C. K. Schneider — Ill. Handb. Laubholzk. I, 1906, p. 690 — (= *Sorbus graeca* [Spach] Hedl. = *Pirus meridionalis* B. *cretica* A. u. G. — Syn. VI, 2, 1906, p. 100).

Paphlagonia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai, in pineto, ca. 1350 m, unicus frutex (18. VII. — No. 856); ibidem, ad rivulum vallis Yaila-Chai (mons Eldiven-Dagh), una cum *Berberide, Rubis, Salicibus, Lonicera etrusca* dumeta constituens, alt. 1350—1460 m (18. VII. — No. 295). Inter Küre et Edjevid, in monte Kush-Tepe, in fageto, substrato calcareo, ca. 1450 m (5. VIII. — No. 656).

My specimens No. 656 resemble very much those collected by Sintenis in the same locality; Schneider remarks about his exsiccata: "Besondere Formen der var. *graeca* stellen vielleicht noch

dar die Expl. lg. Sintenis, No. 5128, Paphlagonien." (l. c. p. 690, footnote ***). — In view of the great variability of the leaves in the same individual and the scarcity of the material I do not segregate my No. 656 from the var. *graeca*, although some of the leaves much exceed in their dimensions (11 : 9 cm) the usual ones of this variety.

*Sorbus torminalis* (L.) Crantz. — Bithynia: circa Hendek. in latere meridionali montis Ohlamurluk (vallis Ulu-Dere), in fageto-querceto. alt. 450—530 m, rarior (24. VI. — No. 83). — Galatia: supra oppidulum Arab. in parte superiore vallis Yaila-Chai, in fruticetis ripariis, ca. 1500 m (18. VII. — No. 850). — Paphlagonia: in silva mixta ad orientem ab Edjevid, in collibus ad occidentem vergentibus, ca. 1112 m, frequens (6. VIII. — No. 649). Inter Küre et Ineboli, prope rivulum Alma-Dere, in silva mixta (*Ostrya*, *Fagus*, *Pinus*, *Abies*), ca. 700 m, fr. (7. VIII. — No. 655).

*Mespilus germanica* L. — Bithynia: circa Hendek, in declivitate meridionali montis Ohlamurluk (vallis Ulu-Dere), frutices in querceto. ca. 500 m (24. VI. — No. 73); ibidem, in declivitate meridionali montis Yilman, in querceto frutescente et in macchia, ca. 400 m. frequentior (25. VI. — No. 97). Inter Hendek et Shekhlar, in declivibus meridionalibus montis Cham-Dagh, in quercetibus frutescentibus (27. VI. — No. 696). — Paphlagonia: in fruticetis ripariis vallis Kuru-Chai (inter Sinopen et Tashköprü), una cum *Ostrya carpinifolia*, *Corylo Avellana* etc. (3. VIII. — No. 608).

*Crataegus tanacetifolia* Poir. — Paphlagonia: supra oppidulum Tukht, in declivitate meridionali collium stepposorum, ca. 1500 m (12. VII. — No. 201). Inter Sinopen et Tashköprü, in parte superiore vallis Kuru-Chai, in sicco alveo arbuscula et frutices solitarii, frequentior (1. VIII. — No. 410).

*Crataegus tanacetifolia* × *orientalis*: *C. Bornmülleri* Zbl. — C. K. Schneider, Ill. Handb. Laubholzk. I, 1906, p. 787. — Paphlagonia: inter Changri et Tukht, arbuscula solitaria ca. 3 m alta, in declivibus meridio-orientalibus collium stepposorum, ca. 1200 m (11. VII. — No. 191).

*Crataegus orientalis* Pall. — Galatia: in declivitate montis Eldiven-Dagh. arbuscula solitaria in agris cultis et vervactis, ca. 1250 m (16. VII. — No. 287).

*Crataegus Azarolus* L. — Paphlagonia: supra oppidulum Tukht, arbuscula solitaria haud procul a cacumine Bokly-Tepe, ca. 1620 m (13. VII. — No. 229). Inter Kastamuni et Edjevid, arbuscula solitaria juxta viam in stepposis et agris cultis, ca. 900 m (4. VIII. — No. 445).

*Crataegus tanacetifolia* × *Azarolus* — Schneider, l. c. I, p. 737. — Galatia: inter Changri et Yanarkeui (in radicibus montis Eldiven-Dagh situm), arbuscula solitaria juxta viam, substratum — marga tertiaria, ca. 1200 m (16. VII. — No. 289).

*Crataegus monogyna* Jacq. — Circa Byzantium: supra pagum Sari-Yar, frutices ca. 2½ m alti in macchia, rarior (12. VI. — No. 14). — Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in silva mixta, ca. 1350 m (5. VIII. — No. 654).

*Pyracantha coccinea* (L.) Roem. (= *Cotoneaster Pyracantha* Spach). — Circa Byzantium: supra pagum Rumeli-Kavak, in macchia (26. I. — No. 723): ibidem, supra pagum Sari-Yar, in macchia juxta viam (2. III. — No. 823). — Bithynia: in planitie Ak-Ova, ad radices montium Cham-Dagh et Kurmaly-Dagh, in sepibus vivis vialibus, frequentissima (29. VI. — Non lecta). — Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in silva mixta (*Taxus*, *Fagus*, *Abies*, *Acer*, *Carpinus*, *Corylus*, *Mespilus* etc.), ca. 1350 m (5. VIII. — No. 442). Prope vicum Djazoglu (inter Sinopen et Tashköprü), in fruticetis ad rivulum Chamkeui-Su (in parte superiore vallis Kuru-Chai), ca. 820 m (2. VIII. — No. 607).

*Cotoneaster nummularia* F. et M. — Paphlagonia: supra oppidulum Tukht, in cacumine montis Panair-Tepe, in margine abieteti, ca. 1950 m (14. VII. — No. 606).

*Cotoneaster nummularia* F. et M. var. *ovalifolia* Boiss. — Paphlagonia: in valle Ilgaz-Su, supra pagum Yajladjik, in latere meridio-occidentali montium, una cum *Junipero Oxycedro*, ca. 2½ m alta, ca. 1130 m (23. VII. — No. 616).

*Rosa* sp. — Bithynia: supra oppidulum Hendek, ad declivia meridionalia montium Cham-Dagh, in pseudomacchia (26. VI. — No. 116).

*Rosa gallica* × *dumetorum* R. Keller ?[1]). Asch. u. Graebn., Synops. VI, 1902, p. 279. — Paphlagonia: in declivitate meridionali jugi Ilgaz-Dagh, juxta viam a Changri ad Kastamuni ducentem, in abieteto-pineto, ca. 1650 m (27. VII. — No. 382).

Prof. Keller considers this determination for not quite certain, for the twigs, which I sent to him, were too short to give the exact idea about the kind of prickles and leafage.

*Rosa canina* L. var. *andegavensis* (Bast.) Desportes f. (nov.) ***paphlagonica*** R. Keller. — Rami subinermes; ramuli fertiles

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[1]) This species and the following one have been determined by the late Prof. Robert Keller.

inermes subinermesve, aculeis singulis, debilibus e basi decurrenti arcuati; stipulae interdum rufescentes latae auriculis latis patentibus, margine ± glanduloso-denticulatae, petioli p.p. rufescentes, eglandulosi. parce aculeolati; folia plerumque 5-foliata; foliola elliptica, terminalia ± 30 : 15 mm usque 35 : 20 mm, dentes rarissime denticulo accessorio muniti; bracteae rufescentes, lanceolatae, pedunculis ± duplo longiores; flores solitarii vel geminati; pedunculi crebre glandulis stipitatis muniti, breves, ± 5—8 mm longi; sepala post anthesin reflexa, appendice lanceolata, exteriora in dorso abunde glandulosa, pinnis lineari-lanceolatis; petala?; pseudocarpia ovata usque globosa, glandulis stipitatis obsita; styli pilosi.

Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in margine silvae mixtae, ca. 1350 m (5. VIII. — No. 423).

*Filipendula Ulmaria* (L.) Maxim. (= *Spiraea Ulmaria* L.). — Paphlagonia: in regione subalpina jugi Ilgaz-Dagh, in ruderatis prope ruinas aedificii, ca. 1700 m (non lecta).

*Rubus*[1]) *sanctus* Schreb. f. ***orientalis*** Czeczott et Hruby — Fedde, Rep. XXVIII, 1930, p. 149. — Proxime affinis *R. ulmifolio* Schott var. *vulgato* Sudre (Mon. Rub. T. LXXVIII), a quo tomento foliorum (supra dense pilosa, pilis stellulatis) et antheris pilosis differt.

Paphlagonia: inter Sinopen et Tashköprü, prope vicum Djazoglu, in fruticetis ad rivulum Chamkeui-Su (in parte superiore vallis Kuru-Chai), una cum *Pteride*, *Clematide*, *Rubis*, ca. 820 m (2. VIII. — No. 492).

*Rubus mostariensis* Sud. f. *superulmifolius* Hruby (= *Rubus sanc-*

[1]) The *Rubi* are arranged according to H. Sudre "Rubi Europae vel Monographia iconibus illustrata Ruborum Europae" 1908—1913.

With the exception of *Rubus tomentosus* Borkh. all my specimens have been determined by Dr. Hruby (Brno). When I was asked to send him my *Rubus*-collection I did not know that he intended to include it in his "*Rubi* peninsulae balcanae" (Fedde, Rep. XXVIII, 1930, p. 140—202). Consequently the labels were not yet prepared for printing (not written in Latin) and imperfect knowledge of English by Dr. Hruby led to numerous mistakes. Again some of the *Rubi* collected by me were quite omitted. This inclined me to republish the list with all notes once more. — A very unpleasant mistake also crept into the quotation from my letter, published by Dr. Hruby at the end of his paper: I have not seen any "Birkenwälder" in Bithynia; this was a wrong translation of the word "Beechwoods". — Quite recently Dr. Kulesza (Poznań) became interested in my *Rubi* and looked them through.

*tus* Schreb. < *ulmifolius* Hruby) — Sudre, l. c. p. 76, Hruby l. c. p. 150 —. Antherae pilosae, cetera ut in *R. ulmifolio*.

Paphlagonia: circa pagum Yailadjik (jugum Ilgaz-Dagh), in regione fruticum rarorum, frutices alti ad fossam irrigatoriam, ca. 1130 m (23. VII. — No. 324).

*Rubus procerus* P. J. Müll. var. *hedycarpus* (Focke) Hruby (= *R. discolor* W. et N. et pl. aut.). — Hruby l. c. p. 152. — Inflorescentia angustior, sed apicem versus vix decrescens, aculeis debilioribus, falcatis vel uncinatis (plerumque) crebris armata, brevi-tomentoso hirsuta, denique calvescens; petala obovata, alba[1]).

Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in silva mixta (*Fagus, Abies, Taxus, Carpinus, Acer*), ca. 1400 m, frequens (5. VIII. — No. 446). In declivitate orientali montis supra oppidulum Küre, in faucibus inter frutices *Populi tremulae* et *Pinorum*, ca. 1250 m, frequens (5. VIII. — No. 462).

*Rubus procerus* P. J. Müller var. *amiantinus* Focke — Hruby l. c. p. 152 — Differt a *R. lepido* P. J. Müll. acumine foliorum breviori.

Bithynia: in valle Bichki-Dere (jugum Kurmaly-Dagh), frutices alti solitarii, ca. 300 m (30. VI. — No. 146).

*Rubus procerus* P. J. Müller var. **sanctiformis** Hruby — l. c. p. 152. — Turio? Ramus florifer brevissime pilosulus aculeis mediocribus basi paulum dilatatis satis dense instructus, eglandulosus, robustus. Inflorescentia in ramis maioribus ampla, perfoliata, apicem vix decrescens, pedunculis distantibus, dense hirsuta, aculeis maioribus firmis hamosis instructa. Pedunculi fere flavo velutini, ut sepala ovata dense aculeis debilioribus obsita. Flores satis magni dilute rosei, petala cycloidea. Stamina stylos paulum superantia, non pilosa. Folia ramealia ternata, supra glabra, nitescentia, subtus appresse albotomentosa, ad nervos praeterea dense pilosa, mediocriter et inaequaliter (fere dupliciter) serrata. Foliolum terminale ovato-rhombeum basi cuneatum, vix acuminatum. Foliola inflorescentiae nonnumquam cyclocordata aut cordato-ovata.

Folia illis *R. sancti* Schreb. simillima, sed differt statim aculeis non tam basi dilatatis, vestimento foliorum et staminibus epilosis. Rami floriferi debiliores ostendunt inflorescentiam angustiorem.

Bithynia: circa Hendek, in alveo sicco vallis Isak-Oglu-Dere,

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[1]) Dr. Hruby relates to the series of *Rubi proceri* the following species: *R. procerus* (P. J. Müller) Hruby (integumentum infl. luteo-velutinum!), *R. discolor* (Weihe) Hruby, *R. macrostemon* Focke, and *R. thyrsanthus* Focke.

in regione fageto-carpinetorum, densa fruticeta passim constituens, una cum *R. tomentoso*, *R. serpente* et *R. tereticaule*, ca. 250 m (27. VI. — No. 422).

*Rubus Linkianus* Ser. (series *Ri. proceri — tomentosi*) (= *R. procerus* > *tomentosus*) — Hruby l. c. p. 153. — Folia subtus pilosa.

Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in margine silvae mixtae, ca. 1350 m (5. VIII. — No. 423).

*Rubus tomentosus* Borkh. var. *canescens* Wirtg. — Focke, Spec. Rubor. III, p. 367/143 (= var. *typicus* Sudre — l. c. p. 98 — according to Hruby: var. *genuinus* Sudre f. *meridionalis* Kerner — l. c. p. 159).

Paphlagonia: in declivitate orientali jugum Ilgaz-Dagh, in pineto raro in regione subalpina, gregatim, ca. 1700 m (28. VII. — No. 381).

*Rubus tomentosus* Borkh. var. *glabratus* Godr. (= *R. Lloydianus* Genev.) — Sudre, l. c. p. 99 — (according to Hruby l. c. p. 160: var. *Lloydianus* Genev. f. *hypoleucus* West.). — Bithynia: circa Hendek, in alveo sicco vallis Isak-Oglu-Dere, passim densa fruticeta cum aliis speciebus *Rubi* constituens, in regione fageto-carpinetorum, ca. 250 m (27. VI. — No. 421).

*Rubus tereticaulis* P. J. Müll. var. ***Czeczottiae*** Hruby — l. c. p. 166. — Turio teres, dense pilosus, pilis distantibus, virescens, aculeis nullis, aciculis nonnullis debilibus tenuissimis, glandulis paucis sessilibus instructus. — Folia 3-nata, supra densius pilosa, subtus dense pilosa, fere tomentosa, cinerascentia, micantia, pilis ad nervos pectinatis. Serratura tenuissima, aequalis, dentibus pilosis. Foliolum caul. termin. ovatum usque late ovatum, basi leviter cordatum, breviter acuminatum; foliola lateralia ovata, e. p. foliolo terminali obtecta. Petiolus (ut turio) dense tomentosus, sparsissime aciculatus. — Inflorescentia brevis, lata, *R. caesii* simillima, pedunculis distantibus, dense hirsuta, glandulis sessilibus et stipitatis purpureis, aciculis tenuibus sparse obsessis. — Flores mediocres; petala alba, stamina alba stylis virescentibus longiora. Sepala canotomentosa, aciculis atropurpureis glandulisque stipitatis sparse instructa (var. *curtiglandulosus* Sudre differt serratura inaequali et glandulis crebris).

Bithynia: circa Hendek, in declivitate montis Yilman (vallis Ulu-Dere), in querceto, ca. 450 m (25. VI. — No. 491).

*Rubus tereticaulis* P. J. Müll. var. *argutipilus* Sudre f. ***bithynicus*** Hruby — l. c. p. 169. — Differt a var. *argutipilo*: Inflorescentia fere

omnino calvescens, brevissime tantum pilosula, debilissimis, nonnulis aculeis, glandulis paucissimis aciculisque instructus (ut in formis quibusdam var. *finitimae* Sudre) ut pedunculi; atque sepala calvescentia, albo-micantia, appresse tomentosula. Stamina alba stylis virescentibus multo longiora. Flores albi. Folia 3-ternata (?), utrinque paululum et disperse pilosula (ceterum calva, subtus viridia). Foliolum terminale caulinum obovatum, brevi acuminatum, subaequaliter et fere dupliciter serratum. Turio?

Bithynia: circa Hendek, in alveo sicco vallis Isak-Oglu-Dere, passim densa fruticeta una cum *Rubo tomentoso, R. procero* et *R. serpente* formans, in regione fageto-carpinetorum, ca. 250 m (27. VI. — No. 425).

*Rubus tereticaulis* P. J. Müll. var. *saxetanus* Sud. f. ***anatolicus*** Hruby — l. c. p. 167. — A typo differt inflorescentia fere glabra (brevissime pilosa), sepalis longis, fere bracteatis. Turio?

Bithynia: circa Hendek, in declivitate montis Yilman (vallis Ulu-Dere), in querceto, ca. 450 m (25. VI. — No. 88).

*Rubus Kupcokianus* Borb. (*R. tomentosus* > *serpens* Hruby) f. ***villosi-floccosus*** Hruby — l. c. p. 161. — Integumentum foliorum subtus villosi-floccosus. — Paphlagonia: prope viculum Djazoglu (inter Sinopen et Tashköprü), in parte superiore vallis Kuru-Chai, in fruticetis ad rivulum una cum *Pteride, Clematide et Pyracantha*, ca. 820 m (2. VIII. — No. 411).

*Rubus serpens* Whe. var. *spinosulus* Sud. f. ***obovatus*** Hruby — l. c. p. 174. — Foliolum terminale caulinum obovatum, basi subemarginatum, breviter acuminatum.

Bithynia: circa Hendek, in alveo sicco vallis Isak-Oglu-Dere, passim densa fruticeta cum aliis speciebus *Rubi* constituens in regione fageto-carpinetorum, ca. 250 m (27. VI. — No. 126).

*Rubus serpens* Whe. var. *longisepalus* P. J. Müll. f. ***grossodentatus*** Hruby. — Folia ut in var. *oreades* P. J. Müller serrata.

Bithynia: circa Hendek, in alveo sicco vallis Isak-Oglu-Dere, gregatim cum aliis speciebus *Rubi* in regione fageto-carpinetorum, ca. 250 m (27. VI. — No. 126 bis).

*Rubus hirtus* Waldst. et Kit. var. *hercinicus* G. Braun f. *begoniifolius* Holuby — Österr. Bot. Zeitschr. XXV, 1875, p. 315. Dr. Hruby remarks: "proxime meae formae *Stresovii* (vide "Rubi peninsulae balcanae")" — l. c. p. 184.

Paphlagonia: inter Küre et Edjevid, in latere boreali montis Kush-Tepe, in abieteto-fageto, ca. 1400 m (5. VIII. — No. 424).

*Geum rivale* L. — Paphlagonia: in declivitate montis Büyük-Ilgaz-Dagh, in abieteto ad torrentem, ca. 1700 m (28. VII. — No. 375).

*Fragaria vesca* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia ad rivulum (2. III. — No. 320). — Bithynia: circa Hendek in declivitate meridionali montis Ohlamurluk (vallis Ulu-Dere), in querceto, substrato schistoso, ca. 650 m (3. II. — No. 755). — Paphlagonia: in declivitate boreali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m (28. VII. — No. 605).

*Potentilla alpestris* Haller var. *typica* Th. W. (= *P. bithynica* Horn.). — Th. Wolf, Monographie der Gattung *Potentilla*. Bibliotheca Botanica, H. 71, 1908, p. 547. — Paphlagonia: in cacumine montis Büyük-Ilgaz-Dagh, in alpinis, ca. 2500 m (24. VII. — No. 604). Sub cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2300 m (26. VII. — No. 615).

*Alchemilla Grossheimii* Juz.[1]) — ap. Grossheim, Fl. Caucas. IV, 1934, p. 323. — Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in cacumine montis Khadji-Aghach *Pinis* circumdato, ca. 1750 m (1. VIII. — No. 603).

*Alchemilla erythropoda* Juz. — ap. Grossheim, Fl. Caucas. IV, 1934, p. 323. — Paphlagonia: in regione alpina montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2120 m (26. VII. — No. 936).

From the following note, dating from 1930, it is seen that I suspected this specimen to represent a new species: "By the rather dense indumentum of the leaves my specimen resembles *A. caucasica* Buser, yet the villosity of the inflorescence is as scanty as in the specimens of *Alchemilla* from the Bithynian Olympus, determined by Buser as *A. flabellata*. With only one specimen collected, it is hard to tell whether we are not dealing in this case with a new species, intermediate between *A. caucasica* and *A. flabellata*."

***Alchemilla brachyloba*** Rothm. nom. nov. (= *A. indivisa* Rothm., non Formanek, in "Systematische Vorarbeiten zu einer Monographie der Gattung *Alchemilla*", Fedde, Rep. XXXIII, 1934, p. 346.) — Paphlagonia: supra oppidulum Tukht, ad radices montis Bokly-Tepe, in angustiis prope cataractam, ca. 1450 m (13. VII. — No. 237).

*Alchemilla mollis* (Buser) Rothm. — Rothmaler, l. c. p. 347. — Paphlagonia: supra oppidulum Tukht, ad radices montis Bokly-Tepe, in angustiis sub cataracta, una cum *A. brachyloba*, ca. 1450 m (13. VII. — No. 273 bis).

[1]) My Turkish specimens of *Alchemilla* were quite recently (1937) revised by Dr. W. Rothmaler (Berlin), who kindly rectified some of my determinations.

I have determined this specimen as *A. acutiloba* Stev. ssp. *catillaris* Buser, which subspecies seems to me to differ by the character of the indumentum (more silky and adpressed) from ssp. *mollis* of the same author[1]). The origin of this subspecies was hitherto unknown. Buser, when describing it from cultivated specimens, added: "Origo dubia" (No. 4656 Herb. Norm.). On another label applying to *A. acutiloba* Steven ssp. *catillaris* f. *altissima* Buser, we read: "E montibus Uralensibus provenire dicitur" (No. 4657, Herb. Norm.), which seems rather improbable: the collective species *A. acutiloba* Steven inhabits Transylvania, the Balkan Peninsula, Asia Minor and the Caucasus.

*Alchemilla acutiloba* Steven ssp. ***amoena*** Czeczott (Pl. XXXII, Fig. 3) — l. c. p. 37[2]).

Staturae modice, coeruleo-viridis, caules 2—5 erecti, foliosi, parte inferiore horizontaliter villosi, inflorescentiam versus glabrati, pilis solitariis ad basin pedicellorum obsiti; folia basilaria velutino-villosa, subreniformia, (7) 9 (11)-loba, lobis exterioribus sinum angustum includentibus; lobi profundi, ad $^1/_3$ radii longitudinem incisi, parabolici vel semiorbiculati, circumcirca minute et regulariter dentati, dentibus utrinque 6—10, subaequalibus, penicillato-mucronulatis. Folia caulina numerosa, reniformia. Folia supra disperse pubescentia, subtus tota facie $\pm$ dense molliter villosa, costis et nervis secundariis valde prominentibus reticulata: inflorescentia in triente superiore caulis laxe paniculata; flores laete flavi, longe pedicellati, stellati; sepala et calyculi foliola inter se aequalia, nervis tribus anastomosantibus, prominentibus percursa, urceolo obconico dimidio longiora.

Dimensiones: caules 16—23 cm alti: folia 2—5½ cm longa, 1½—3 cm lata; petioli 3½—6 cm longi; diam. florum 3—4 mm; urceoli ¾—1 mm longi; sepala et calyculi foliola ad 1½ mm longa; pedicelli 2—3 mm longi.

Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), ad fontem in pinetis declivis meridionalis montis Khadji-Aghach, ca. 1470 m (1. VIII. — No. 407).

It differs from the other subspecies of *A. acutiloba* Steven (namely from ssp. *mollis*, *pontica*, *speciosa*, *catillaris* Buser) by its

[1]) Rothmaler (l. c. p. 348) sees no difference between *A. catillaris* Bus. and *A. mollis* Bus.

[2]) Rothmaler considers it a good species.

medium size, much smaller leaves with very regular teeth, resembling those of *A. flabellata* Buser, and by smaller flowers with equal segments.

*Poterium muricatum* Spach. — Circa Byzantium: supra pagum Sari-Yar, in graminosis siccis, substrato calcareo, passim abunde (12. VI. — No. 49).

*Poterium spinosum* L. — Circa Byzantium: supra pagum Rumeli-Kavak. in ruderibus veteris castri (26. I. — No. 821).

## *Myrtaceae.*

*Myrtus communis* L. — Paphlagonia: circa Ineboli, in macchia prope litus arenosum (8. VIII. — No. 481). Supra oppidulum Zunguldak. in arduo declivi ad mare vergente, solo calcareo, una cum *Phyllirea media*, fl. fr. (11. VIII. — No. 488).

## *Oenotheraceae (Onagraceae).*

*Epilobium angustifolium* L. (= *E. spicatum* Lam.). — Paphlagonia: in jugo Ilgaz-Dagh, in silvis combustis, una cum herbis stepposis et silvaticis. ca. 1900 m (24. VII. — No. 264). Supra oppidulum Tukht, in cacumine montis Panair-Tepe (non lectum).

*Epilobium Dodonaei* Vill. — Paphlagonia: ad radices boreales jugi Ilgaz-Dagh. in loco Kuz-Yahy dicto, in detritu mobili juxta viam. passim gregatim, ca. 1250 m (28. VII. — No. 597).

*Epilobium hirsutum* L. γ *villosum* Hausskn.? — C. Haussknecht, Monographie der Gattung *Epilobium*. 1884, p. 55. — Paphlagonia: supra Edjevid. ad fossam gregatim. ca. 1100 m (6. VIII. — No. 464).

*Epilobium parviflorum* Schreb. — Bithynia: circa Hendek, in valle Takhtarlyk-Dere: semina tantum collecta (2. II. — No. 718 — de seminibus collectis in horto botanico Cracoviensi educatum).

*Epilobium montanum* L. — Paphlagonia: ad radices boreales jugi Ilgaz-Dagh, in loco Kuz-Yahy dicto. in detritu mobili juxta viam, passim gregatim, ca. 1250 m (28. VII. — No. 597).

*Epilobium lanceolatum* Sebast. et Maur. — Bithynia: circa Hendek, in declivi montis Ohlamurluk (vallis Ulu-Dere). in querceto, ca. 450 m (24. VI. — No. 697); ibidem, ad radices montis Yilman, in fruticetis ad rivulum. rarius (25. VI. — No. 92).

*Circaea Lutetiana* L. — Bithynia: in valle Bichki-Dere (jugum Kurmaly-Dagh), in fruticetis ripariis, una cum *Telekia speciosa*, *Petasite officinali*. *Lysimachia verticillata* et aliquot speciebus *Rubi* ca. 250 ad 300 m (30. VI. — No. 698).

## *Callitrichaceae.*

*Callitriche* sp. — Bithynia: circa Hendek, in valle Isak-Oglu-Dere, in aqua stagnante, ca. 200 m (11. II. — No. 731).

Undetermined on account of lack of fruits.

## *Cucurbitaceae.*

*Bryonia multiflora* Boiss. et Heldr. — Galatia: inter Arab et Changri, in fruticetis juxta viam, ca. 1200 m, rarior (19. VII. — No. 315).

*Bryonia alba* L. — Paphlagonia: in valle Kuru-Chai (inter Sinopen et Tashköprü), in sepe viva in margine agri tricitei, ca. 850 m (1. VIII. — No. 602).

## *Datiscaceae.*

*Datisca cannabina* L.[1]) — Bithynia: circa Hendek, in sicco alveo vallis Takhtarlyk-Dere, ca. 2½ m alta, ca. 240 m (1. II. — No. 738); ibidem, in valle Isak-Oglu-Dere, ad ripam rivuli gregatim, una cum *Petasite officinali*, ca. 250 m (27. VI. — No. 125).

## *Crassulaceae.*

*Sedum stoloniferum* Gmel. — Paphlagonia: inter Küre et Edjevid, in latere boreali montis Kush-Tepe, in regione silvarum mixtarum, loco aperto (in silva excisa), ca. 1350 m, gregatim, hoc loco tantum (5. VIII. — No. 447).

From the nature of its distribution (Boiss., Fl. Or. II, 779) *S. stoloniferum* belongs to the so-called South-Euxine floristic element. The ancient age of this species is clearly displayed by its occurrence in the Amanus mts. (the Akma-Dagh near Beilan,

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[1]) Among the specimens of *Datisca cannabina* L. in the Museum of Natural History in Paris there is one: 5114, Aucher-Eloy, "secus Chahrone", which I presume to be the cause of the erroneous datum on the presence of *Urtica cannabina* L. in Northern Persia. This species is to be excluded, in my opinion, from the "Flora Orientalis" (vol. IV, p. 1147), for Boissier did not see it and cites his only locality after Weddell. On p. 77 of the "Monographie de la Famille des Urticacées" Paris, 1856 by H. A. Weddell we find under *Urtica cannabina* L. "prope Teheran, secus flum. Chahront (Aucher-Eloy, exsicc. No. 5314)". No such species is present in Paris among the plants collected by Aucher-Eloy. The text of the label — "secus Chahrone" and No. 5314, which could have been easily mistaken for 5114, as well as the same adjective "*cannabina*" speak in favour of my supposition.

The distribution of *Datisca cannabina* is discussed and depicted in: Czeczott, 18, p. 55, fig. 12a.

Kotschy, No. 98, 1862, under *Sedum ibericum* Stev.), which locality is distant many hundreds of kilometres from the general area (Northern Persia, Caucasus, Pontus). The occurrence in Paphlagonia extends this range considerably in a westerly direction and allows one to expect the finding of this species also in other parts of the forest region of Northern Anatolia.

*Sedum album* L. — Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, inter lapides ad viam, ca. 1300 m (5. VIII. — No. 652).

*Sedum album* L. var. *micranthum* (Bastard) DC. — Fl. fr. VI, 1815, p. 523. — Paphlagonia: supra oppidulum Tukht, in fissuris saxorum, in declivitate boreali montis Bokly-Tepe, ca. 1600 m (13. VII. — No. 228). Inter Changri et pagum Yailadjik (vallis Ilgaz-Su), infra transitionem jugi ca. 1305 m (20. VII. — No. 601). Prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere meridio-orientali vallis Chamkeui-Su *Quercibus* frutescentibus obsito, inter lapides et scorias fodinae derelictae, ca. 850 m (31. VII. — No. 622).

*Sedum altissimum* Poir.? — Ins. Prinkipo: in cacumine aperto, inter saxa quarticica (26. II. — No. 788).

*Sedum Sempervivum* Ledeb. — Galatia: supra oppidulum Arab, in declivitate montis Eldiven-Dagh, in stepposis, ca. 1600 m (18. VII. — No. 596). — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in declivitate meridionali collium stepposorum, ca. 1440 m, passim frequens (12. VII. — No. 215).

*Sedum glaucum* W. K. β *eriocarpum* Boiss. — Paphlagonia: in declivitate meridionali infra cacumen et in cacumine montis Büyük-Ilgaz-Dagh, ca. 2450—2500 m (24. VII. — No. 355).

*Sedum glaucum* W. K. γ *bithynicum* Boiss. — Bithynia: circa Hendek, in valle Ulu-Dere, in glarea riparia, ca. 300 m (26. VI. — No. 122).

*Sedum pallidum* M. B. — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere meridio-orientali vallis Chamkeui-Su, in fissuris rupium et inter scorias fodinae derelictae, ca. 850 m (31. VII. — No. 393).

*Sempervivum ruthenicum* J. Koch. — Synops. Fl. Ger. et Helv., ed. II, vol. I, 1845, p. 289. — Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in montosis, ca. 1000 m (2. VIII. — No. 625).

Lehmann and Schnittspahn ("Flora", XXXVIII, 1855, p. 5) give the following features which distinguish the related *S. globi-*

*ferum* L. from *S. ruthenicum* Koch: 1) "Die breitere oben abgerundete und kurzgespitzte Form der Rosettblätter". 2) the stalk at first bent down, afterwards upright, 3) much larger and with lighter yellow coloured petals. This last feature I cannot confirm but add a rather important point: 4) difference in the form and dimensions of the hypogynous scales: in *S. ruthenicum* they are as large as the ovaries at their base, broader than long, rotundate, contiguous, flat and horizontally patent. In *S. globiferum* — semiovate, narrower than long, about half as broad as those of *S. ruthenicum* and directed upwards.

I place under *S. ruthenicum* J. Koch the following specimens: Paphlagonia, Tossia (Sintenis, It. or. 1892, No. 1897); Pontus, Sumila (Sintenis, It. or. 1889, No. 1671); Armenia Turcica, Gumuschkhane, pr. Ardas (Sintenis, It. or. 1889, No. 3395); Djimil Ponti Lazici (Balansa); Sommet de l'Ali-Dagh, 1700 m (Balansa); Cappadocia "überall", 1800—3000 m (Siehe, No. 272); Anatolia (Wiedemann) determined as *S. globiferum*, *S. cappadocicum* etc.; I have seen also numerous specimens of this species originating from the south-eastern part of Poland (Wolhynia and Podolia) and Southern Russia, and a few specimens from Dobruja (Matschin, Sintenis, 1873, No. 660) and from near Varna in the Balkan Peninsula (collected by Ronniger in 1931)[1]). I have had no opportunity of verifying whether *S. Zeleborii* Schott represents *S. ruthenicum* Koch, but they are treated as synonyms in Hayek, Prodromus Florae peninsulae Balcanicae I, 1927, p. 620, and in Stoyanoff and Stefanoff, Flore de la Bulgarie, 1925, p. 545. This requires examination, for Velenovsky, Flora Bulgarica, 1891, p. 188, gives for "*S. ruthenicum* Koch (*S. Zeleborii* Schott)" hypogynous scales of different shape. than described by me above; according to him they are: "brevissimae glanduliformes" (i. e. of the shape peculiar to *S. globiferum* L.). — In the Caucasian countries *S. ruthenicum* Koch is absent[2]), in the central part of Armenia and in Kurdistan it is replaced by *S. armenum* Boiss., which possesses the hypogenous scales of the subquadrate lamelliform shape and in accordance with this has to be segregated from *S. ruthenicum* Koch[3]).

[1]) The same locality has been communicated to me by Prof. Stoyanoff (by letter).

[2]) Communicated by A. A. Grossheim.

[3]) No. 118 from Kurdistan: Kanyga, collected by Major Cowie (Herb. Kew), represents, in my opinion, *S. armenum* Boiss. (not *S. ruthenicum* Koch).

From what is said above it follows that the range of *S. ruthenicum* has a considerable longitudinal extension: from Cappadocia to Southern (and Central?) Russia. The occurrences given by Boissier for *S. globiferum* L. most probably apply to three different species: *S. ruthenicum* Koch, *S. globiferum* L. and *S. armenum* Boiss.[1]).

## *Saxifragaceae.*

*Saxifraga rotundifolia* L. f. *repanda* (Willd.) Engl. et Irmscher — Saxifragaceae. Das Pflanzenreich IV. 117. 1. 1916. p. 186. — Paphlagonia: in abieteto declivis borealis montis Büyük-Ilgaz-Dagh, gregatim, frequentissima, ca. 2100 m (24. VII. — No. 360).

*Saxifraga rotundifolia* L. f. *vulgaris* Engl. — l. c. p. 185. — Paphlagonia: inter Küre et Edjevid, in declivi boreali montis Kush-Tepe, ad rupes calcareas in fageto cum *Carpino, Taxo, Abiete* et *Acere* mixta, ca. 1460 m (5. VIII. — No. 651).

*Saxifraga cymbalaria* L. var. α. *eucymbalaria* Engl. et Irmsch. — l. c. p. 202. — Bithynia: supra oppidulum Hendek, in valle Su-Atak-Dere, in aqua gelida torrentis. fol. (6. II. — No. 766): ibidem, in rupe verticali humida, juxta cataractam, ca. 465 m (26. VI. — No. 102 et 102 bis). — Paphlagonia: in declivi boreali montis Büyük-Ilgaz-Dagh, in abieteto ad torrentem, ca. 1700 m (28. VII. — No. 594).

## *Umbelliferae.*

*Eryngium bithynicum* Boiss. — Paphlagonia: inter Changri et pagum Inekeui (ad fl. Devrez-Chai), in stepposis, ca. 1000 m (21. VII. — No. 591).

*Eryngium maritimum* L. — Paphlagonia: prope Ineboli, in litore arenoso, copiosissime (8. VIII. — No. 480).

*Eryngium giganteum* M. B. f. *Haussknechtii* (Bornm.) Wolff — H. Wolff, Umbelliferae-Saniculoideae in Engler, Das Pflanzenreich IV. 228. 1913. p. 124. — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere vallis Armutly-Yelik, ca. 850 m (1. VIII. — No. 600).

Our specimen was collected in the hill altitudinal zone, though this species is generally considered as a subalpine and alpine plant.

*Sanicula europaea* L. — Bithynia: circa Hendek, in valle Isak-

[1]) As Mr. Praeger's monograph on the genus *Sempervivum* is not to be found in any institution in Warsaw, I am unable to take into account this author's views on the relations between the above-mentioned three species of *Sempervivum*.

Oglu-Dere, in locis umbrosis humidis ad rivulum, ca. 250 m, fol. (11. II. — No. 775); ibidem, fl. (27. VI. — No. 124). — Paphlagonia: in declivitate boreo-occidentali montis Kush-Kayasy (jugum Ilgaz-Dagh), in abieteto, ca. 1940 m (26. VII. — No. 589).

*Pimpinella Tragium* Vill. var. — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai (mons Eldiven-Dagh), in pineto, ca. 1350 m (18. VII. — No. 277).

*Pimpinella Tragium* Vill. var. *Pseudotragium* (DC.) Boiss. — H. Wolff, l. c. p. 25. — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai (mons Eldiven-Dagh), in pineto, ca. 1350 m (18. VII. — No. 592).

*Bunium Bourgaei* (Boiss.) Freyn et Sint. β *cataonicum* Boiss. — H. Wolff, l. c. p. 194. — Paphlagonia: in cacumine montis Büyük-Ilgaz-Dagh, in regione alpina, ca. 2500 m (24. VII. — No. 340).

***Smyrnium galaticum*** Czeczott (Pl. XXXIII) — l. c. p. 38.

Elatum, glabrum; caulis crassus, teres, superne opposite ramosus, corymbosus; folia basilaria . . . (destructa), caulina alterna, 2—3 subternatim pinnatisecta, segmentis ovatis vel attenuato-cuneatis, crenulato-dentatis, petiolo elongato, in vaginam papyraceam, basin et apicem versus attenuatam, dilatato; folia ramigera inferiora tripartita, subsequentia indivisa, cordato-ovata, sublobata, obtuse crenata vel integra, omnia petiolo breviter vaginato; folia superiora opposita, sessilia, cordato-triangularia vel ovato-cordata, basi auriculata, inter se libera, integerrima; umbellae (6) 10—15 (17)-radiatae, radiis demum saepe incrassatis (rarius bifurcatis), involucro et involucello carentes; flores . . . fructus (fere maturi) parvi, brunescenti-nigri, mericarpiis a latere compressis, dorso rotundato, jugis tribus prominentibus percurso, stylis erecto-patulis vel flexuosis, stylopodio breviter conico vix longioribus.

Dimensiones: caules ad 150 cm alti; foliorum caulinorum segmenta 3—4 cm lg., 1,5—2 cm lata, folia ramigera inferiora 5—7 cm lg. 4—7 cm lata, folia ramigera superiora 2—5 cm lg., 2—5 cm lata; fructus 2 mm alti, 3—4 mm lati.

Galatia: supra oppidulum Arab, in declivi occidentali montis Eldiven-Dagh, in fruticetis humidis ad fontem Yaila-Chai, ca. 1450 m (18. VII. — No. 303).

This beautiful species, found by me once only and as a single specimen, is most closely related to the Persian-Armenian *Smyrnium cordifolium* Boiss.; it differs from the latter species by dilated-petiolate cauline leaves, by the angular mericarps and the styles

hardly longer than the stylopodes. By its upper leaves, which are not grown together, our new species is easily distinguished from *Smyrnium connatum* Boiss. et Ky.

*Oenanthe pimpinelloides* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia et in locis apertis, frequens (12. VI. — No. 33).

*Siler trilobum* L. — Galatia: supra oppidulum Arab, in valle Yaila-Chai (mons Eldiven-Dagh), in fruticetis ad rivulum, ca. 1450 m (18. VII. — No. 300). — Paphlagonia: supra oppidulum Ineboli. in declivi mare versus vergente, in macchia et limitibus hortorum et agrorum (9. VIII. — Semina tantum lecta).

*Ferulago pauciradiata* Boiss. et Heldr. — Paphlagonia: in fissuris praeruptarum rupium in arduo latere versus vallem fl. Devrez-Chai (mons Ai-Dagh), supra viam. (21. VII. — No. 320).

*Tordylium apulum* L. — Circa Byzantium: supra pagum Rumeli-Kavak, in declivi arduo Bosporum versus (12. VI. — No. 3).

***Heracleum paphlagonicum*** Czeczott (Pl. XXXIV) — l. c. p. 38.

Sectio: *Eu-heracleum* — Boiss., Fl. Or. II, p. 1039.

Procerum, caulis striato-sulcatus, parce papillatus, asperulatus, foliosus, parte superiore ramosus, ad basin ramorum longius et densius papilloso-barbulatus; folia supra glabriuscula (ad nervos sparsim puberula), subtus tenuissime puberula, ad nervos et margines minute aspera, pinnatisecta, bijuga (an semper?), segmentis lateralibus inferioribus petiolatis, plus minus profunde tripartitis, terminalibus profunde tripartitis, partitionibus omnibus late oblongis, apice rotundatis breviter acuminatis, lobatis, irregulariter crenulato-dentatis: petiolus foliorum caulinorum in vaginam pubescentem, brunnescentem, saepe purpureo-dilutam. dilatatus; umbellae, ad 40 cm diametro, multiradiatae (18), radiis valde inaequalibus, plus minus pubescentibus. involucro post anthesin deciduo; umbellulae bracteis involucellorum subulatis, pedicellis subvelutino-pubescentibus; petala alba, florum radiantium profunde sub angulo acuto bipartita, caeterorum minora, perspicue unguiculata; ovarium elongatum, clavatum, puberulum, stylis longis. divaricatis, apice clavatis, tandem patentibus; fructus (fere maturi) valde graveolentes, ellipsoideo-elongati. utrinque perspicue attenuati, alis angustissimis, dorso et margine sparsim papillosi vel glabriusculi. vittis dorsalibus $^5/_6$ pericarpii aequantibus, subaequilongis, basi late clavatis, inter se approximatis. vel saepe contiguis, vittis commissuralibus binis, ad $^2/_3$ mericarpii perductis, stylis stylopodio conico, acuminato, longioribus, pedicellis fructu sesqui-vel duplo longioribus.

Dimensiones: caules 100—140 cm alti, fructus 12 mm longi, 4 mm lati, alae ad ½ mm latae.

Paphlagonia: ad latera borealia montis Ilgaz-Dagh, in locis humidis ad marginem silvarum regionis abietinae, alt. ca. 1750 m (27. VII. — No. 383).

This highly aromatic species grows abundantly along the side of the road connecting Ankara with Ineboli, in the mountain chain of Ilgaz-Dagh. By the shape and indumentum of its leaves it is to be placed near to *Heracleum pubescens* M. B., but by the elongate form of its fruits and strong odour to *H. persicum* Desf.

*Malabaila Sekakul* Russell. — Galatia: inter pagum Ravly and oppidum Kaledjik, in transitu montium inter fluvios Sakaria et Kizyl-Irmak, in collibus stepposis, ca. 1300 m (10. VII. — No. 183).

*Malabaila carvifolia* Boiss. et Bal.? — Paphlagonia: prope pagum Yailadjik (vallis Ilgaz-Su), in regione fruticum rarorum inter plantas stepposas, ca. 1130 m (22. VII. — No. 588).

The solitary specimen with the flowers in a young condition permits only a doubtful identification to be made.

*Daucus Carota* L. — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), in valle Chamkeui-Su, in fruticetis ripariis, ca. 830 m (3. VIII. — No. 414 et 414 bis). Circa Edjevid, in margine abieteti, ca. 1200 m (6. VIII. — No. 650).

*Caucalis daucoides* L. — Paphlagonia: supra oppidulum Tukht in loco Chirchir-Bunar dicto, in faucibus declivium meridionalium collium stepposorum, ad rivulum, ca. 1400 m (12. VII. — No. 214).

## ***Araliaceae.***

*Hedera colchica* C. Koch. — Bithynia: supra oppidulum Hendek, in valle Ibrik-Dere, in fageto-querceto arbores amplectens, ca. 420 m (31. I. — No. 701); ibidem, humi serpens, ca. 420 m (31. I. — No. 707); ibidem, in valle Su-Atak-Dere (3. II. — No. 736); ibidem, in declivitate montis Salman-Tepe, in silva mixta, *Fagos* et *Carpinos* amplectens, ca. 550 m, fr. (6. II. — No. 763). — Paphlagonia: inter Küre et Edjevid, in declivi boreali montis Kush-Tepe, in fageto *Carpino*, *Taxo*, *Acere* et *Abiete* admixta, solo calcareo, ca. 1460 m (5. VIII. — No. 653).

This species has been known hitherto as the liane peculiar to the shady forests of Colchis and eastern part of Pontus mts. (Handel-Mazzetti, 29, p. 173), and in an isolated outpost in the Amanus mts. (Northern Syria, Siehe, 71, p. 189). The finding

of *Hedera colchica* in the western and central part of Northern Anatolia is one more proof favouring the view that all of the forest region of Northern Asia Minor constitutes with the Colchis one and the same phytogeographical region.

### *Cornaceae.*

*Cornus mas* L. — Circa Byzantium: supra pagum Sari-Yar, solitariae arbusculae in limite agrorum cultorum (2. III. — No. 747). — Bithynia: inter oppida Hendek et Ada-Bazar, ad ripam fluminis (29. VI. — No. 137). — Paphlagonia: in valle fluminis Kuru-Chai (inter Sinopen et Tashköprü), in coryletis et inter frutices *Quercuum* et *Ostryae carpinifoliae*, copiosissime, ca. 700 m (30. VII. — No. 385).

*Cornus australis* C. A. Mey. — Bithynia: inter oppida Hendek et Ada-Bazar, ad ripam fluminis prope viam (29. VI. — No. 138).

### *Caprifoliaceae.*

*Sambucus Ebulus* L. — Bithynia: circa Hendek, in confluente rivulorum vallium Ulu-Dere et Ohlamurluk-Dere, hoc loco gregatim, ca. 370 m (non lecta).

*Sambucus nigra* L. — Bithynia: circa Hendek, in valle Su-Atak-Dere satis frequens, ca. 380 m (26. VI. — No. 118).

*Viburnum Opulus* L. — Paphlagonia: inter Küre et Edjevid, in declivitate septentrionali montis Kush-Tepe, in silva mixta, ca. 1350 m (5. VIII. — No. 453).

*Viburnum Lantana* L. — Galatia: circa Arab, in declivi boreo-orientali montis Eldiven-Dagh, in fruticetis *Quercuum* juxta viam, alt 1300—1400 m (16. VII. — No. 281). — Paphlagonia: inter Küre et Edjevid, in declivi septentrionali montis Kush-Tepe, in silva mixta, ca. 1350 m (5. VIII. —No. 454).

*Lonicera Etrusca* Santi var. *glabra* Boiss. herb. — Circa Byzantium: supra pagum Sari-Yar, passim in macchia (12. VI. — No. 21). — Galatia: supra oppidulum Arab, ad fontem rivuli Ai-Deressi (in monte Eldiven-Dagh), inter fruticeta, una cum *Pruno Mahaleb* ca. 1400 m (16. VII. — No. 284).

*Lonicera orientalis* Lam. — Galatia: circa Arab, in valle Yaila-Chai (mons Eldiven-Dagh) inter fruticeta ad rivulum, ca. 1400 m (18. VII. — No. 310). — Paphlagonia: inter Küre et Edjevid, in declivi septentrionali montis Kush-Tepe, in silva mixta, ca. 1350 m (5. VIII. — No. 455).

## *Rubiaceae.*

*Rubia tinctorum* L. — Galatia: inter Changri et Arab, in fruticetis ad fluvium Yanar-Chai, frequentior, ca. 890 m (19. VII. — No. 863).

*Rubia peregrina* L. — Circa Byzantium: supra pagum Sari-Yar, ad viam, fruticibus *Quercuum* implexa (2. III. — No. 790).

*Crucianella graeca* Boiss. — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), inter *Pinos* et fruticeta *Quercuum* in latere orientali vallis Chamkeui-Su, ca. 850 m (31. VII. — No. 609).

*Asperula glomerata* M. B. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in trachyticis saxis, ca. 1600 m (14. VII. — No. 249).

***Asperula refracta*** Czeczott — l. c. p. 39[1]).

Sectio: *Cynanchica* — De Candolle, Prodr. IV, 1830, p. 582.

Perennis, suffruticosa, tota minute pubescenti-scabrida, multicaulis; caules divaricato-flexuosi, ramosi, ramulis saepe refractis; folia quaterna, anguste-linearia, crassiuscula, margine revoluta, breviter mucronata, patula vel flexuosa, floralia basi connata; bracteae oblongae, acuminatae: fasciculi multiflori, oppositi, inferiores pedunculati, caeteri subsessiles; corollae albae (in sicco sordido albae vel brunneae), hirtellae, campanulatae, lobis lanceolatis, acutiusculis, callosis, laciniis tubo brevioribus: ovarium ovatum, tuberculatum.

Dimensiones: caules 20—35 cm alti, folia 10—15 (18) mm longa, 0,5—1 mm lata, corollae 5 mm longae.

Paphlagonia: inter oppida Tukht et Changri, in declivitate orientali collium stepposorum, ca. 1100 m (15. VII. — No. 269 et 269 bis).

Related to *Asperula stricta* Boiss. β *longifolia* Boiss., from which it differs by the flexuose stems with refracted branchlets and white campanulate corollas (not reddish infundibuliform).

*Asperula nitida* Sibth. β *hirtella* Boiss. — Paphlagonia: in cacumine montis Büyük-Ilgaz-Dagh, inter *Juniperos nanas*, ca. 2500 m

[1]) When describing this species in 1928 I overlooked a short note by Velenovsky (87, Supplementum, p. 143) on an *Asperula* — which he supposed to be a new species — collected by Bornmüller. A full description of *Asperula Bornmülleri* Velen., made not long ago by Bornmüller in "Diagnoses plantarum novarum e Florae Anatoliae (12, p. 66), allows one to suppose that perhaps my new species is identical with it. I do not feel quite certain of this, for according to Bornmüller Velenovsky's new *Asperula* is near to *A. graveolens* M. B., while mine is most closely related to *A. stricta* Boiss.

(24. VII. — No. 337). In cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m (26. VII. — No. 950).

*Asperula graveolens* M. B. — Galatia: in transitu montium, ad viam a Yanarkeui (Seraikeui?) ad Arab ducentem, inter saxa et in agro culto, ca. 1250 m (16. VII. — No. 288).

*Asperula involucrata* Bergr. et Wahlenb. — Paphlagonia: in declivi montis Büyük-Ilgaz-Dagh, in pineto, ca. 1700 m (27. VII. — No. 901); ibidem, in declivi septentrionali, in abieteto, ca. 1700 m, rarior (28. VII. — No. 378).

*Asperula odorata* L. — Paphlagonia: inter Küre et Edjevid, in declivi septentrionali montis Kush-Tepe, in silva mixta (*Abies*, *Fagus*, *Taxus*, *Carpinus* etc.), in saxis calcareis, ca. 1460 m (5. VIII. — No. 658).

*Galium rotundifolium* L. — Paphlagonia: in abieteto montis Büyük-Ilgaz-Dagh, ca. 1700 m (28. VII. — No. 955).

*Galium longifolium* Sibth. — Bithynia: in valle Bichki-Dere (jugum Kurmaly-Dagh), in declivi occidentali montis Geuk-Tepe, in fageto, ca. 300 m, frequentior (30. VI. — No. 149).

*Galium erectum* Huds.? — Paphlagonia: inter oppida Tukht et Changri, in declivitate orientali collium stepposorum, ca. 1100 m (15. VII. — No. 933). In cacumine montis Büyük-Ilgaz-Dagh, ca. 2500 m (24. VII. — No. 902). In cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m (26. VII. — No. 902 bis).

*Galium orientale* Boiss. β. *alpinum* Boiss. — Paphlagonia: in cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m (26. VII. — No. 940).

*Galium aureum* Visian. δ. *scabrifolium* Boiss. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in fissuris saxorum, ca. 950 m (7. VII. — No. 174). — Paphlagonia: inter oppidum Changri et pagum Inekeui (ad fl. Devrez-Chai), sub monte Ai-Dagh, in stepposis, ca. 1350 m (20. VII. — No. 862).

*Galium verum* L. — Galatia: inter pagum Ravly et Kaledjik, in transitu montium inter fluvios Sakaria et Kizyl-Irmak, in collibus stepposis, ca. 1300 m (10. VII. — No. 187). — Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in declivi montis Khadji-Aghach, in pineto, alt. 1400—1700 m (1. VIII. — No. 689).

*Galium spurium* L. γ. *tenerum* Gr. et Godr. — Paphlagonia: supra oppidulum Tukht, in abieteto montis Panair-Tepe, ca. 1900 m (14. VII. — No. 888).

## *Valerianaceae.*

*Valeriana alliariaefolia* Vahl. — Galatia: supra oppidulum Arab, in valle Yaila-Chai (mons Eldiven-Dagh), prope rivulum inter fruticeta *Populi tremulae, Ligustri vulgaris* et aliorum, ca. 1405 m (18. VII. — No. 301). — Paphlagonia: supra oppidulum Küre, in declivi orientali montis, inter fruticeta *Populi tremulae*, in alveo torrentis, ca. 1250 m (5. VIII. — No. 688).

*Centranthus longiflorus* Stev. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in declivi orientali arduo collium stepposorum, in fissuris rupium dolomiticarum et calcarearum, ca. 1500 m, hoc loco copiose (12. VII. — No. 203); ibidem, in nudis saxis trachyticis ad orientem spectantibus, ca. 1600 m (14. VII. — No. 891).

## *Dipsacaceae.*

*Morina persica* L. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in collibus stepposis, ca. 1550 m, frequens (14. VII. — No. 217). In depasta declivitate meridionali montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 1500 m, fl. (26. VII. — Non lectum).

*Dipsacus laciniatus* L. — Bithynia: in planitie Ak-Ova, juxta viam a Hendek ad Ada-Bazar ducentem (15. II. — No. 735, capitula sicca tantum lecta). — Paphlagonia: prope Edjevid, in limite agrorum cultorum, ca. 1100 m (6. VIII. — No. 659). Inter oppidum Tashköprü et pagum Kuru-Chai, juxta viam, ca. 750 m (30. VII. — No. 392).

*Cephalaria procera* Fisch. et Lallem. — Paphlagonia: prope Edjevid, in limite agrorum cultorum, ca. 1100 m (6. VIII. — No. 660).

*Scabiosa ucranica* L. — Paphlagonia: prope pagum Yailadjik (vallis Ilgaz-Su), in margine praerupti, inter plantas stepposas, ca. 1130 m (23. VII. — No. 327 et 903). Circa Kastamuni, in collibus calcareis, in stepposis, ca. 900 m (29. VII. — No. 932.)

*Scabiosa palaestina* L. β. *latiloba* Boiss. — Galatia: inter oppida Tukht et Changri, juxta viam in margine segetum, ca. 1100 m (15. VII. — No. 271). Inter oppida Changri et Arab, in aridis graminosis montis Eldiven-Dagh, juxta viam, ca. 1200 m (19. VII. — No. 960, semina tantum lecta).

## *Compositae.*

*Eupatorium cannabinum* L. — Paphlagonia: inter Küre et Ineboli, in fruticetis *Fagi*, ad viam in declivi montium versus Pontum Euxinum vergentium, ca. 1000 m (7. VIII. — No. 471).

*Solidago Virga aurea* L. — Galatia: supra oppidulum Arab. in declivi septentrionali montis Eldiven-Dagh, in silva *Pini nigrae*, frequentior, ca. 1350 m (18. VII. — No. 854); ibidem, inter fruticeta ad rivulum in valle Yaila-Chai, ca. 1450 m (18. VII. — No. 306).

*Aster alpinus* L. — Paphlagonia: in cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m (26. VII. — No. 939).

*Erigeron pulchellum* (Willd.) DC. — Paphlagonia: in cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m, frequentior (26. VII. — No. 372).

*Bellis silvestris* Cyrill. — Circa Byzantium: supra pagum Sari-Yar, in macchia, fl. (25. I. — No. 784).

*Telekia speciosa* Schreb. — Bithynia: in ima valle Bichki-Dere (jugum Kurmaly-Dagh), prope rivulum, ca. 300 m, passim gregatim (30. VI. — No. 142).

*Pallenis spinosa* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia (12. VI. — No. 30).

*Inula Montbretiana* DC. — Paphlagonia: supra oppidulum Tukht, in declivi meridionali collium stepposorum, ca. 1400 m (11. VII. — No. 198); ibidem, in loco Chirchir-Bunar dicto, in stepposis, ca. 1550 m (14. VII. — No. 890).

*Pulicaria dysenterica* L. — Circa Byzantium: supra pagum Rumeli-Kavak, in macchia (16. VIII. — No. 824).

*Helichrysum graveolens* M. B.[1]) — Paphlagonia: in declivi meridio-orientali montis Büyük-Ilgaz-Dagh, in pineto locis apertis, ca. 1800 m (24. VII. — No. 334); in cacumine montis Büyük-Ilgaz-Dagh, rarior, ca. 2500 m, fol. (24. VII. — No. 338).

*Filago germanica* L. — Circa Byzantium: supra pagum Sari-Yar, in locis apertis (calcareis?) juxta viam, ca. 150 m, gregatim (12. VI. — No. 36).

*Achillea micrantha* M. B. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in stepposis saxosis, alt. 1100—1200 m (5. VII. — No. 164). Inter Angora et Kaledjik, in transitu montium inter fluvios Sakaria et Kizyl-Irmak, in collibus stepposis, ca. 1300 m (10. VI. — No. 188). — Paphlagonia: prope pagum Yailadjik (vallis Ilgaz-Su), in vervacto et in praerupto una cum herbis stepposis, ca. 1130 m, frequens (23. VII. — No. 904).

*Anthemis tinctoria* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia (25. I. — No. 783; 12. VI. — No. 25).

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[1]) The distribution of the above species is discussed in: Czeczott, 18, p. 61, fig. 16.

*Anthemis rigescens* Willd. — Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in declivi montis Khadji-Aghach, in silva *Pini nigrae*, ca. 1400 m (1. VIII. — No. 612).

*Leucanthemum vulgare* Lamk. ssp. ***paphlagonicum*** Czeczott — l. c. p. 40.

Rhizoma tenue, repens, caules singulos, 40—50 cm altos, strictos, glabriusculos vel parce papilloso-pubescentes, in medio ramosos (an semper?), dense foliatos, ramis 1-cephalis erectis vel subpatentibus, edens. Folia basilaria . . . (destructa), caulina sessilia, subamplexicaulia, usque ad capitula dispersa, inferiora approximata, spathulato-elongata, 4—5 cm longa, 10—12 mm lata, superiora lanceolato-spathulata, sensim diminuta, omnia obtuse et parce dentata, apice obtusiuscula. Capitula radiata, 3,5—5 cm lata: involucrum phyllis (30—40) anguste-lanceolatis, apicem versus sensim angustatis, acutiusculis, supra pallide viridibus, apice et marginibus stramineo-viridibus, nervo saepe pallide brunnescentibus, externis 4—5 mm longis, internis 8—9 mm longis, apice scarioso lacero-dilatatis, omnibus ca. 1 mm latis. Flosculi marginales ligulati, albi, feminei (20—28 mm longi, 3—5 mm lati), caeteri lutei, neutri. Achenia brunnea albo-costata, radii — unilateraliter bipartito-coronata, disci — nuda.

Paphlagonia: inter Küre et Ineboli, in pratis regionis fruticetorum *Fagi* et *Quercu*, ca. 1000 m, abunde (7. VIII. — No. 472).

I place here also the specimen "Küre-Nahas, pr. Topschi-Chan" Sintenis, It. or. 1892, No. 5009, sub *Leucanthemo vulgari* — det. J. Freyn.

From the shape of the leaves, the colour of the involucre and the presence of the membranaceous border in a part of achenes it is near to ssp. *pallens* Briquet (Flore des Alpes Maritimes, 84, vol. VI. 1, 1916, p. 87), yet the stems in our *Leucanthemum* are ramiferous, more richly foliate, and the phyllaries are very unequal and twice narrower. From ssp. *montanum* Briquet (l. c. p. 24) and *Chrysanthemum heterophyllum* Willd. it is distinguished by the ramiferous, densely foliate stems, narrower phyllaries, which are often darker on the margins, etc. Lastly, from *Chr. trapezunticum* Hand.-Mzt. (29, p. 194) it differs by the shape of leaves and the character of the achenes: in the species from near Trapezunt the leaves are acutely dentate, with an acute apex, and all the achenes are devoid of pappus.

In a note which follows the description of his new species — *Chr. trapezunticum* — Handel-Mazzetti draws attention to the absence

of *Chr. Leucanthemum* L. and related species in Asia Minor. He refers the specimens collected by Sintenis near Küre (It. or. 1892, No. 5009) to *Chr. pallens* Gay and expresses the supposition that they are probably not spontaneous (l. c. p. 195). After seeing my specimens, which are quite identical with those of Sintenis, he agrees with me that they apply to a form, which occupies an intermediate position between *Chr. pallens* and *Chr. trapezunticum*[1]).

There is no doubt about the spontaneity of our new subspecies in Northern Paphlagonia: it was collected by Sintenis and me in two localities about 20 km distant from each other, and grows abundantly in the meadows and among the bushes and sparse trees of *Quercus* and *Fagus* at the height of about 900 m near the road connecting Küre with Ineboli, on the slope of the range facing the Black Sea.

*Pyrethrum poteriifolium* Ledeb. f. (nov.) ***multicaule*** Czeczott. — Caulibus e collo pluribus.

Paphlagonia: supra oppidulum Tukht, in cacumine montis Panair-Tepe, in margine abieteti, ca. 1950 m (14. VII. — No. 247).

In the Herbier Boissier in Geneva there are to be found almost all known exsiccata of this species. Their study gives support to the view expressed by Bornmüller (10, I, p. 18) that *P. poteriifolium* Ledeb. (Fl. Ross. II, 1844, p. 550) is not a synonym of *P. corymbosum* (L.). The specific distiction of Ledebour's species, as compared with *P. corymbosum* L. is displayed also by a different — as it seems — distribution, which is according to the materials present in the Herbier Boissier, as follows: Circassia: Noworossyisk (Lipsky, Radde); Black Sea district: Tuapse (?); Abchasia: Suchum (Lipsky) and Mt. Mamdrychkha (under *P. Starckianum* Alboff n. sp.); Pontus mts. (*P. ponticum* Alboff n. sp.)[2]); Gümüschkhane (Sintenis, No. 7220). Amasia (Bornmüller. No. 706b); Paphlagonia: Tossia (Sintenis, No. 4206; the three latter under *P. anserinaefolium* Hausskn. et Bornm.)[3]), the occurrence given by me — Tukht, Panair-Tepe — is only about 50 km (in a straight line) distant from Tossia (see Map 2). According to Lipsky (43, p. 349) *P. poteriifolium*

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[1]) For those who ascribe the specific rank to the two forms the name of that described by me will be *Chr. paphlagonicum* Czeczott.

[2]) Both new species of Alboff are considered by Lipsky (43, p. 349) as synonyms of *P. poteriifolium* Ledeb.

[3]) Bornmüller identifies *P. anserinaefolium* Hausskn. with *P. poteriifolium* Ledeb. (10, Ser. I, p. 18).

Ledeb. is to be found in the Pontic province and in the district of Kuban; Paphlagonian occurrences extend this area in westerly direction.

*Pyrethrum Parthenium* L. — Bithynia: supra oppidulum Hendek, in declivi meridionali montis Ohlamurluk (vallis Ulu-Dere), in querceto raro. ca. 550 m. certis locis gregatim (24. VI. — No. 70).

*Artemisia maritima* L. — Paphlagonia: inter Tukht et Changri, in collibus stepposis ad orientem vergentibus, ca. 1100 m (15. VII. — No. 267). Inter oppidum Tashköprü et pagum Kuru-Chai, in stepposis nec non campis cultis, passim copiosissime, ca. 600 m (30. VII. — No. 396).

*Artemisia fragrans* Willd.? — Circa Byzantium: prope pagum Sari-Yar, in pariete argilloso juxta viam (2. III. — No. 793).

*Petasites officinalis* Moench. — Bithynia: circa Hendek, in valle Ulu-Dere, ad rivulum, florescens (10. II. — No. 770); ibidem, in valle Isak-Oglu-Dere, ad rivulum et in rivulo, ca. 250 m, fol. (27. VI. — No. 127).

*Tussilago Farfara* L. — Circa Byzantium: supra pagum Sari-Yar, in praerupta ripa argillosa rivuli (2. III. — No. 791). — Bithynia: circa Hendek, in valle Ulu-Dere, ad rivulum, fl. (3. II. — No. 754); ibidem, in valle Isak-Oglu-Dere, in petasiteto ad rivulum, frequentissima, prima folia edens, ca. 250 m (11. II. — No. 778).

*Senecio vernalis* W. K. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in saxosis stepposis, ca. 1200 m (5. VII. — No. 153). — Paphlagonia: inter Changri et Tukht, in collibus stepposis ad orientem vergentibus, ca. 1100 m (15. VIII. — No. 630).

*Calendula arvensis* L. — Circa Byzantium: supra pagum Sari-Yar, in margine macchiae (2. III. — No. 792). — Ins. Prinkipo: in cacumine nudo haud procul a monasterio, in saxis quarciticis (26. II. — No. 799).

*Echinops Tournefortii* Ledeb.[1]). — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in saxosis stepposis, ca. 1100 m (5. VII. — No. 150).

*Xeranthemum squarrosum* Boiss. β *unicolor* Boiss. — Galatia: in collibus stepposis ad orientem Angorae, solo trachytico, ca. 1200 m (5. VII. — No. 156). Inter urbem Angora et oppidum Changri, in stepposis, ca. 700 m (10. VII. — No. 849)? — Paphlagonia: in

[1]) Determined by Dr. Fr. Nábělek (Brno).

declivi arduo montis Ai-Dagh versus fl. Devrez-Chai, in regione fruticum rarorum, ca. 1200 m (21. VII. — No. 865).

The specimens No. 849 are distinguished by 60—75-flowered capitula, according to which feature they match neither *X. annuum* L. nor *X. squarrosum* Boiss.

*Chardinia xeranthemoides* Desf. — Galatia: inter pagum Ravly et oppidum Kaledjik, in transitu montium inter fluvios Sakaria et Kizyl-Irmak, in collibus stepposis, ca. 1300 m (10. VII. — No. 182).

*Carlina intermedia* Schur? — Enumeratio plantarum Transsilvaniae, 1866, p. 413 — (according to Hegi, Ill. Fl. Mitteleur. VI, 2, p. 823 — this is a synonym of *C. vulgaris* L. f. *leptophylla* Griesselich). — Bithynia: circa Hendek, in lateribus apertis vallis Ibrik-Dere macchia destitutis, ca. 250 m (1. II. — No. 716).

*Carlina corymbosa* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia, deflor. (16. VIII. — No. 825).

*Carlina corymbosa* L. var. *graeca* Boiss. — Galatia: circa Arab, in parte superiore vallis Yaila-chai (mons Eldiven-Dagh), in fruticetis ad rivulum, ca. 1450 m (18. VII. — No. 853).

*Cirsium hypoleucum* DC. — Bithynia: circa Hendek, in declivi meridionali montis Ohlamurluk (vallis Ulu-Dere), in querceto raro, ca. 500 m (24. VI. — No. 74). Inter Küre et Edjevid, in declivi boreali montis Kush-Tepe, in silva mixta, ca. 1350 m (5. VIII. — No. 661).

*Cirsium elodes* M. B. var. *indivisum* DC. — Galatia: supra oppidulum Arab, ad fontem rivuli Yaila-Chai (mons Eldiven-Dagh), una cum *Valeriana alliariaefolia* et *Umbelliferis*, ca. 1450 m, gregatim (18. VII. — No. 305).

*Cirsium Acarna* L. — Paphlagonia: prope pagum Kuru-Chai (inter Sinopen et Tashköprü), ad fossam, una cum *Mentha silvestri*, ca. 750 m (3. VIII. — No. 417).

*Onopordon tauricum* Willd. — Paphlagonia: prope Edjevid, juxta viam a Kastamuni ad Ineboli ducentem, una cum *Dipsaco laciniato*, ca. 1150 m, frequens (7. VIII. — No. 468).

*Jurinea anatolica* Boiss. — Paphlagonia: inter Changri et Tukht, in collibus stepposis ad orientem vergentibus, ca. 1100 m (15. VII. — No. 931).

*Jurinea consanguinea* DC. var. — Prodr. VI, 1837, p. 676 — (= *J. anatolica* Boiss. var. *consanguinea* Boiss.). — Paphlagonia: prope Kastamuni, in collibus calcareis, in stepposis, ca. 900 m (29. VII. — No. 929).

My unique specimen is remarkable for its almost glabrous phyllaries.

*Centaurea axillaris* Willd. δ. *cana* Boiss. (= *C. cana* Sm.). — Paphlagonia: in declivi meridio-orientali montis Büyük-Ilgaz-Dagh, in pratulo humido, in regione pinetorum. ca. 1835 m (24. VII. — No. 331).

*Centaurea axillaris* Willd. var. *cana* f. *stenophylla* Boiss. herb. (= *C. cana* Sibth. var. *angustifolia* Boiss. herb.). — Paphlagonia: supra oppidulum Tukht, in regione fruticum rarorum. sub *Quercibus* frutescentibus, ca. 1500 m (13. VII. — No. 244). In cacumine montis Büyük-Ilgaz-Dagh, inter gramina alpina (*Bromus*, *Festuca*, *Sesleria*), alt. ca. 2300—2500 m (24. VII. — No. 941); in cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), in regione alpina, ca. 2300 ad 2400 m (26. VII. — No. 942).

This form, distinguished by narrow leaves, is obviously limited to more dry habitats than the former.

*Centaurea patula* DC.[1]). — Paphlagonia: inter Changri et Tukht, in collibus stepposis, una cum *Acantholimo*, *Paronychia* etc. ca. 1100 m (15. VII. — No. 930).

*Centaurea squarrosa* Willd. (= *C. virgata* Lam. β. *squarrosa* Boiss.). — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in saxosis stepposis, ca. 1200 m (5. VII. — No. 169); inter Ravly et Kaledjik, in transitu montium inter fluvios Sakaria et Kizyl-Irmak in collibus stepposis, ca. 1300 m (10. VII. — No. 919).

*Centaurea consanguinea* DC. — Paphlagonia: prope pagum Kuru-Chai, (inter Sinopen et Tashköprü) in declivi arido, stepposo, ca. 750 m (3. VIII. — No. 624). Prope Kastamuni, in collibus calcareis, in stepposis, ca. 900 m (4. VIII. — No. 928).

*Centaurea myconia* Boiss. — Diagn. vol. III, fasc. 6, 1859, p. 113. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in saxosis stepposis, ca. 1200 m (5. VII. — No. 159).

A careful examination of rather numerous specimens of *C. Urvillei* DC. and *C. myconia* Boiss. in both herbaria in Geneva (Herb. Boiss. and Herb. De Candolle) has convinced me that Boissier was not right in considering them as synonyms and the description which he gives for *C. myconia* does not quite agree with the description of *C. Urvillei* of De Candolle. In Prodromus VI, 1837, p. 592 we read: „caule brevi, apice parce ramoso, foliis . . . segmentis . . .

[1]) Beginning with this all the following *Centaurea* were determined by the late Dr. Hayek.

ovato-rhombeis grosse et irregulariter dentato incisis, capitulo solitario subsessili . . .". In Flora Orientalis III (1875), 665: "subacaulis . . . foliis segmentis subdentati . . . terminali . . . ovato lateribus ovato-oblongis . . . lobulis ovatis minutis . . . secus rachidem saepe obviis, caule . . . simplici . . . vel subnullo, capitulis in rosula subsessilibus . . .".

***Centaurea Czeczottiae*** Hayek (Pl. XXXV, Fig. 2a, 2b) — l. c. p. 40.

Sectio: *Acrocentron* — Boiss., Fl. Or. III, p. 617.

Radix crassa verticalis; folia basilaria rosulata, longiuscule petiolata, lyrato-pinnatisecta, adpresse et parce arachnoideo-asperulata, glaucescentia, segmentis ovato- vel oblongo-lanceolatis, irregulariter dentatis vel repandis, terminalibus caeteris 2—3-plo maioribus, lateralibus utrinque 2—4, basi decurrentibus, rachite non vel plus minus lobulata; caulis subnullus vel brevis, raro foliis subaequilongus, valde striatus, acute angulatus, parce arachnoideus, 1- rarius 2-cephalus, foliis caulinis in lobos paucos partitis vel subintegris; capitula magna, ovata, saepe in rosulam (4—8) subsessilem congesta; squamae intermediae ovatae, adpressae, glabriusculae, pallide virentes, obscure striatae, ciliatae, appendice straminea (rarius rufescente) late triangulari-lanceolata, longe pectinatim ciliata (ciliis 3—5 mm longis), in spinam validam, strictam, margine spinulosam, subtus vix canaliculatam, flosculis breviorem abeunte; spinae squamarum inferiorum tenuiores, perspicue recurvae; squamae intimae appendice inermi fimbriata, concavae vel cucullatae; flosculi albi, fauce aurantiaco-striati, omnes non radiantes, antheris concoloribus; achenia maiuscula, compressa, adpresse hirta, sericea, saepe partim nuda, nitida, basi longius hirsuta, pappo vix longiore coronata.

Dimensiones: caulis 0—10 (15) cm altus; folia basilaria circ. 15 cm lg., 5 mm ad medium lat., folia caulina 2—7 cm lg., 1½—2½ cm lat., capitulum florigerum 4—5 cm altum, involucrum 2½—4 cm altum, 2½—4 (raro 5) cm latum, achenium cum pappo 14 mm lg., sine pappo 6 mm longum.

Paphlagonia: supra oppidulum Tukht, in declivibus apricis montis Bokly-Tepe, ca. 1600 m (13. VII. — No. 238, Pl. XXXV, Fig. 2). — Armenia Turcica: Kharput, in montosis (11. VI. 1889 — No. 732; Sintenis, It. Or. — sub *C. Urvillei* DC., det. Dr. O. Stapf).

From the character of the appendages of the intermediate phyllaries it is related to *C. myconia* Boiss., the leaves are very near to those of *C. Urvillei* DC., but the colour of the flowers — white — distinguishes it from both (owing to the presence of more or less

numerous orange veins in the throat [faux] of the flowers the impression of flesh-colour when seen from a distance is obtained).

This species was determined and named by the late Dr. A. v. Hayek, but on account of his illness and death was sent to me undescribed. The following note was made by Dr. Hayek: "Is the same plant as Sintenis, It. Or. 1889, No. 732 from Kharput." After some researches I descovered it under *C. Urvillei* DC. — The above description has been made after the specimens collected by me and by Sintenis in Anatolia. I have cultivated this *Centaurea* from its seeds, as well as *C. myconia* (originating from near Ankara), in the Botanical Garden in Cracow. It has been very instructive to notice the different behaviour of the two: while *C. myconia* has grown miserably, but has retained its features, remaining acaulescent, with rosulate heads (capitula), and with almost unchanged dimensions of the leaves, my new species has changed its aspect to such an extent that I hardly recognized in it my Anatolian plant. It has grown into a stately plant (about 35 cm high), with very ramified stalks, bearing several scores of capitula smaller than originally, the dimensions of the leaves surpassed at least twice those collected in the original localities. Still I have left the description as it was, considering the changes as having been caused by artificial conditions: the excess of humidity, deep soil etc. In Anatolia it grows in extremely dry habitats, being a member of rock-steppe communities in the subalpine region. Anyhow the experimental cultivation shows what a relative value our descriptions have, especially when they concern the dimensions.

*Centaurea solstitialis* L. — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), juxta semitam in declivi saxoso, depasto ad orientem vergente, ca. 850 m (2. VIII. — No. 412).

*Scolymus hispanicus* L. — Paphlagonia: prope oppidulum Ineboli in litore arenoso (8. VIII. — No. 487).

*Lapsana grandiflora* M. B. — Paphlagonia: in declivi meridionali montis Büyük-Ilgaz-Dagh, in silva *Pini nigrae*, ca. 1800 m (24. VII. — No. 938).

*Tragopogon coloratus* C. A. Mey. — Paphlagonia: in jugo Ilgaz-Dagh, in declivi viali ad orientem vergente, inter plantas stepposas in regione pinetorum et abietetorum, ca. 1450 m (24. VII. — No. 357).

*Tragopogon majus* Jacq. — Circa Byzantium: supra pagum Sari-Yar, inter frutices in horto (12. VI. — No. 47).

*Scorzonera mollis* M. B. — Galatia: supra oppidulum Arab, in declivi occidentali montis Eldiven-Dagh, in stepposis, ca. 1600 m (18. VII. — No. 313).

***Scorzonera nutans*** Czeczott (Pl. XXXVI) — l. c. p. 41.

Sectio: *Eu-scorzonera* DC. — § 4 Pulvinares — Boiss., Fl. Or. III. 1875, p. 756.

Compacte pulvinata, pumila, rhizomate crasso, pluricipite, collis densissime squamis nigro-brunnescentibus vestitis. Folia omnia basilaria, rosulas inter se dense approximatas formantia, brevia, plana, 3-nervia, adpresse canescentia, apicem versus glabrata, basi in petiolum scariosum vix dilatata, 1—3 cm longa, 1—2 mm lata. Scapi folia aequantes vel paulo breviores, monocephali, 1—3 cm (cum capitulo) alti, ± dense albo-canescentes, 1—2 squamulis instructi, perspicue nutantes (sub anthesi, an semper?). Capitula parva, involucro phyllis flavo-virentibus, exterioribus oblongo-lanceolatis, subpatulis, 2—3 mm longis, 1—1.5 mm latis, acutiusculis, interioribus elongato-lanceolatis, ad 8 mm longis, 2—3 mm latis, sensim late acuminatis, omnibus glabriusculis vel puberulo-canescentibus, apice et marginibus densius puberulis; flosculis paucis (15—17) luteis, involucro subaequilongis; acheniis (junioribus) glabris, striatis, basi saepe appendice clavata instructis, pappo sordido achenio multo longiore, setis scabridis, basi non plumosis.

Paphlagonia: in cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m, abunde (26. VII. — No. 439). In regione alpina montis Büyük-Ilgaz-Dagh, ca. 2500 m (non lecta).

In its general appearance it resembles some specimens of *S. pigmaea* Sibth. et Sm. (e. g. from the Bithynian Olympus) and *S. rigida* Auch., but our species is more compact and has nodding capitula. From all species of the group Pulvinares, it differs by the pappus, which in the lower part is not plumose.

The cushions of this interesting plant, being quite flat, reach considerable dimensions (about 20—30 cm in diameter). Judging from the number of old leaf-scales, some specimens probably attain the age of about 50 years!

*Lactuca muralis* L. — Bithynia: circa Hendek, in sicco alveo rivuli, in valle Isak-Oglu-Dere, ca. 250 m (27. VI. — No. 131).

*Hieracium murorum* L. ssp. *oblongum* Jord. var. *abieticolum* Jord.[1]). — K. H. Zahn, Compositae-Hieracium in Engler, Das

[1]) All *Hieracia* collected by me have been kindly determined by Prof. Dr. K. H. Zahn.

Pflanzenreich IV, 280 (1921). p. 301. — Paphlagonia: in declivi montis Kush-Kayasy (jugum Ilgaz-Dagh), in abieteto, ca. 1940 m (26. VII. — No. 902).

*Hieracium maculatum* Smith ssp. *Pollichiae* (Sch.-Bip.) Zahn var. *Anatoliae* Zahn, l. c. p. 516. — Paphlagonia: in declivi meridionali montis Büyük-Ilgaz-Dagh, in silva *Pini nigrae*, ca. 1800 m, certis locis gregatim (24. VII. — No. 333 et 333 bis). Supra vicum Djazoglu (inter Sinopen et Tashköprü), in declivi montis Khadji-Aghach, in silva *Pini nigrae*, ca. 1600 m (1. VIII. — No. 904).

*Hieracium Hoppeanum* Scult. ssp. *antennarioides* Peter, l. c. p. 1153. — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü) in latere meridio-orientali vallis Chamkeui-Su, inter fruticeta *Quercuum* et *Pinos* solitarias, ca. 900 m (31. VII. — No. 901).

*Hieracium cymosum* L. ssp. *paphlagonum* Zahn, l. c. p. 1310. — Paphlagonia: supra oppidulum Tukht, in cacumine montis Panaır-Tepe, in abieteto, ca. 1900 m (14. VII. — No. 260).

*Hieracium auriculoides* Lang ssp. *semiauriculoides* Zahn, l. c. p. 1519. — Paphlagonia: in declivi meridionali montis Büyük-Ilgaz-Dagh, in silva *Pini nigrae*, ca. 1800 m (24. VII. — No. 903).

## *Campanulaceae.*

*Campanula latifolia* L. — Paphlagonia: inter Küre et Edjevid, in declivi boreali montis Kush-Tepe, in silva mixta (*Fagus, Taxus, Abies, Carpinus*), in loco exciso, ca. 1400 m (5. VIII. — No. 450).

*Campanula rapunculoides* L. — Paphlagonia: prope pagum Yailadjik (vallis Ilgaz-Su), in regione fruticum rarorum, ca. 1100 m (23. VII. — No. 916). Prope vicum Djazogla (inter Sinopen et Tashköprü), in latere meridio-orientali vallis Chamkeui-Su, ca. 850 m (31. VIII. — No. 613).

*Campanula persicifolia* L. — Bithynia: circa Hendek, in declivi montis Yilman (vallis Ulu-Dere), in querceto, ca. 450 m (25. VI. — No. 839).

*Campanula latiloba* DC. — Bithynia: circa Hendek, in valle Su-Atak-Dere, in praerupto pariete juxta cataractam, ca. 500 m (26. VI. — No. 107).

*Campanula olympica* Boiss. (= *C. hemschinica* C. Koch) var.? — Paphlagonia: supra oppidulum Tukht, in cacumine montis Panair-Tepe, in abieteto, ca. 1900 m (14. VII. — No. 261). In declivi meridionali montis Büyük-Ilgaz-Dagh, in pineto, ca. 2100 m (24. VII. — No. 365).

I agree with the opinion of Bornmüller (10, I, p. 35) that *C. olympica* Boiss. and *C. hemschinica* C. Koch represent one and the same species. Apparently Boissier himself hesitated how to classify some of the specimens of these *Campanulae*: in his herbarium they are determined and redetermined.

Paphlagonian specimens collected by me in two rather distant localities (Ilgaz-Dagh and Panair-Tepe) and those brought by Sintenis from Paphlagonia ("Kaiseridere" No. 4402 and "Büjük Ilgaz-dagh" No. 4770) are distinguished from others seen by me by "tubo calycino papillis albis obsito", which papillae persist in some flowers also on the upper surface of the lobes of calyx. Should this feature prove to be constant in all specimens from Paphlagonia, they will deserve a varietal name.

*Asyneuma (Podanthum) obtusifolium* (Hausskn.) Bornm. — Ein Beitrag zur Kenntnis der Gattung *Asyneuma* Griseb.. Beih. Bot. Zentralbl. XXXVIII, Zw. Abt. H. 2, 1921, p. 346. — Paphlagonia: in cacumine montis Büyük-Ilgaz-Dagh, ca. 2500 m. fl. (24. VII. — No. 349).

This is the only species of *Asyneuma*, which I have found on the summit of the mountain Büyük-Ilgaz-Dagh. My specimens are much deformed by sheep having the tops eaten away. I presume that the second new species of Haussknecht, cited for the same locality — *Podanthum Aizoon* Hausskn. — represents the same *A. obtusifolium*, but deformed by grazing (compare Bornmüller, l. c. p. 37).

***Asyneuma (Podanthum) eldirenum*** Czeczott (Pl. XXXII, Fig. 1) — l. c. p. 42.

Sectio: *Eu-podanthum*. — Perennia. — Boiss., Fl. Or. III, p. 945.

Tota planta canescenti-scabrida, caulibus e rhizomate crassiusculo numerosis, rigidis, longe spicatis vel subracemosis, crebre foliatis; folia sessilia, ± anguste lanceolata, obtusiuscula, saepe in apice membranaceo-recurvata, supra pubescentia, subtus subpatule hirtello-canescentia, nervis secundariis obsoletis, ab inferioribus obtuse remoto-crenatis ad superiora integra sensim diminuta; flores sessiles, 2—5 in fasciculis breviter pedunculatis strictis sedentes, summi solitarii; calyx scabridus, laciniis lanceolatis conniventibus, tubo turbinato dense albo-pruinoso, obsolete striato, breviore, bracteola lanceolata, obtusa, adpressa, tubo aequilonga: corolla coeruleo-violacea, scabrida, calyce subtriplo longior, laciniis linearibus reticulato-venosis, ad basin usque liberis; capsula ignota.

Dimensiones: caules ca. 40 cm alti: folia 3—3,5 cm longa, 4—7 mm lata; racemi 10—12 cm longi, 2—3 cm in parte media lati; calycis laciniae 1—1,5 mm longae, calycis tubus 2—2,5 mm longus; corollae laciniae 3—4 mm longae, 1—1,5 mm latae[1]).

Galatia: inter oppida Changri et Arab, in aridis graminosis montis Eldiven-Dagh, ca. 1200 m, fl. (19. VII. — No. 232).

From *Asyneuma canescens* (W. K.) Griseb. et Schenk (= *Podanthum canescens* Boiss.) it differs 1) by the entire or distantly crenate margine of the leaves (not closely crenate), 2) by the leaves having on the lower surface obsolete secondary nervation (not prominently retinerved), 3) by the lobes of flowers being shorter than their tube (not longer). From *Asyneuma controversum* (Boiss.) Bornm. and *A. lanceolatum* (Willd.) Hand.-Mzt. it differs by its stalk being densely and adpressedly foliate (not ± loosely and subpatently foliate) and by the entire or crenate leaves (instead of somewhat acutely and remotely denticulate) etc.

*Asyneuma (Podanthum) lanceolatum* (Willd.) Hand.-Mzt. — Ann. K. K. Naturhist. Hofmus. XXVII, 1913, p. 431. — Galatia: supra oppidulum Arab, in latere vallis Yaila-Chai (mons Eldiven-Dagh), in pineto, ca. 1350 m (18. VII. — No. 855).

## *Ericaceae.*

*Vaccinium Arctostaphylos* L. — Bithynia: circa oppidulum Hendek, in declivi montis Salman-Tepe, inter fruticeta *Rhododendri*, pauca folia (6. II. — No. 765); ibidem, in monte Kurt-Dagh, inter fruticeta ad rivulum in valle Isak-Oglu-Dere, ca. 250 m, rarior (11. II. — No. 749); ibidem, in querceto montis Ohlamurluk (vallis Ulu-Dere ca. 500 m, rarior (24. VI. — No. 65); ibidem, in declivi meridio-orientali montis Yilman, in querceto *Fago* admixta, ca. 450 m (25. VI. — No. 702); ibidem, in divisione aquarum rivulorum Ibrik-Dere et Su-Atak-Dere, inter fruticeta *Rhododendri*, ca. 500 m, frequens, fruct. (26. VI. — No. 695). — Paphlagonia: supra oppidulum Küre, in sicco alveo torrentis in declivi orientali montium, ca. 1250 m, fr. et fol. rubescentia (5. VIII. — No. 662 et 657).

Some of the specimens collected in the winter season retained sparse foliage.

*Arbutus Unedo* L. — Circa Byzantium: supra pagum Sari-Yar, in

[1]) For those taxonomists, who unite the genus *Asyneuma* (*Podanthum*) with *Phyteuma*, the name of my new species will be: *Phyteuma eldivenum* Cz.

declivi versus Bosporum, in macchia, alt. 60—180 m, frequens, fl. (25. I. — No. 780), fol. (12. VI. — No. 19); ibidem, supra pagum Rumeli-Kavak, in macchia, fr. (16. VIII. — No. 828). — Bithynia: supra oppidulum Hendek, in latere vallis Ibrik-Dere (in parte inferiore), in pseudomacchia (*Quercus infectoria* × *polycarpa*, *Erica arborea*), ca. 250 m, fl. (31. I. — No. 34); ibidem, in declivi montis Ohlamurluk (vallis Ulu-Dere) fruticeta densa constituens, ca. 500 m, fr. (24. VI. — No. 71). — Paphlagonia: circa Ineboli, in macchia litorali (8. VIII. — No. 484); ibidem, in declivi versus Pontum Euxinum, in limitibus agrorum macchia obsitis, fr. (9. VIII. — No. 490).

*Calluna vulgaris* L. — Circa Byzantium: supra pagum Rumeli-Kavak, in macchia, alt. 60—100 m, hoc loco gregatim (25. I. — No. 897).

*Erica arborea* L. — Circa Byzantium: supra pagum Sari-Yar, in declivi Bosporum versus, in macchia gregatim, una cum *Arbuto Unedine, Cistis, Quercu coccifera*, aliis, florescens (25. I. — No. 782); ibidem, fructicans (12. VI. — No. 827). — Ins. Prinkipo: in pineto raro (*Pinus Brutia*) et in macchia ad viam in montem cum monasterio ducentem (26. II. — No. 798). — Bithynia: circa Hendek, in parte inferiori vallis Ibrik-Dere, in pseudomacchia, ca. 250 m (1. II. — No. 728); ibidem, in declivi meridionali montis Ohlamurluk (vallis Ulu-Dere), in querceto, ca. 650 m, fl. (3. II. — No. 719; 14. II. — No. 772). — Paphlagonia: prope Zunguldak, in alto calcareo litore maris, in macchia una cum *Arbuto Unedine, Rhododendro pontico, Cistis*, aliis (11. VIII. — No. 483).

*Erica verticillata* Forsk. — Circa Byzantium: supra pagum Sari-Yar, in declivi Bosporum versus, in macchia, alt. 60—180 m, frequentior, fl. (25. I. — No. 779); ibidem, sine floribus (12. VI. — No. 826); ibidem, supra pagum Rumeli-Kavak, abunde florens (16. VIII. — No. 813). — Ins. Prinkipo: in pineto (*Pinus Brutia*) fl. (26. II. — No. 800).

*Rhododendron ponticum* L. — Bithynia: circa oppidulum Hendek, fruticeta ad rivulum una cum *Rubo* et *Smilace excelsa* constituens, ca. 200 m, fol. (31. I. — No. 733); ibidem, in valle Ibrik-Dere, densa fruticeta in fageto *Quercu* et *Castanea* admixtis constituens (31. I. — No. 748); ibidem, in utroque latere vallis Ulu-Dere, deflorescens (23. VI. — No. 53 et 53 bis); ibidem, in declivi boreali montis Yilman (vallis Ulu-Dere), ca. 500 m, deflorescens (25. VI. — No. 94); ibidem, in valle umbrosa Isak-Oglu-Dere, deflorescens (27. VI. — No. 693).

— Paphlagonia: circa oppidulum Zunguldak, in alto litore calcareo, in macchia una cum *Erica arborea* et *Arbuto Unedine* (11. VIII. — No. 485).

*Rhododendron flavum* Don. (= *Azalea pontica* L.). — Paphlagonia: circa Edjevid, in declivi montium, in silva mixta (*Pinus, Abies, Sorbus torminalis, Carpinus*), ca. 1100 m copiosissime (6. VIII. — No. 647). Supra oppidulum Küre, in declivi lapidoso orientem versus spectante, densa fruticeta constituens, ca. 1170 m (5. VIII. — No. 458 forma *angustifolia*. No. 459 forma *latifolia*). Inter Küre et Ineboli, in declivi meridionali montium, in pseudomacchia una cum *Quercu colchica, Q. polycarpa* (?), *Erica arborea*, aliis, ca. 900 m (7. VIII. — No. 690).

## *Pirolaceae.*

*Pirola secunda* L. — Paphlagonia: in declivi boreali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m (28. VII. — No. 915); ibidem, in pineto *Abiete* admixta, ca. 1700 m (28. VII. — No. 907 bis.). Supra oppidulum Küre, in alveo sicco torrentis, in declivi orientali montium (in silva excisa?), una cum *Pirola minore*, ca. 1250 m (5. VIII. — No. 664). In declivi montis Kush-Kayasy (jugum Ilgaz-Dagh), in abieteto, ca. 1940 m (24. VII. — No. 949).

*Pirola minor* L. — Paphlagonia: supra oppidulum Küre, in alveo sicco torrentis, in declivi orientali montium (in silva excisa?), una cum *Pirola secunda*, ca. 1250 m (5. VIII. — No. 663).

*Pirola chlorantha* Swartz. — Paphlagonia: in declivi boreali montis Büyük-Ilgaz-Dagh, in vetere abieteto, ca. 2100 m, passim gregatim (24. VII. — No. 364).

*Pirola uniflora* L. — Paphlagonia: in declivi boreali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m (28. VII. — No. 917).

## *Primulaceae.*

*Lysimachia atropurpurea* L. — Galatia: circa Angora, in collibus stepposis ad orientem urbis, in alveo sicco torrentis, ca. 900 m (7. VII. — No. 171).

*Lysimachia punctata* L. var. α. *villosa* Klatt — F. Pax und R. Knuth, Primulaceae in Engler, Das Pflanzenreich IV, 237, 1905, p. 267. — Circa Byzantium: supra pagum Sari-Yar, in margine macchiae juxta viam, ca. 150 m (12. VI. — No. 2).

*Lysimachia punctata* L. β. *verticillata* (M. B.) Boiss. — Bithynia: circa Hendek, in valle Ulu-Dere, in radicibus montis Ohlamurluk, prope rivulum, copiosissime, ca. 370 m (24. VI. — No. 830).

*Cyclamen coum* Mill. — Bithynia: circa Hendek, in ima valle Ulu-Dere, locis apertis, ca. 230 m, fl. (3. II. — No. 753); ibidem, in declivi meridionali montis Köl-Tepe, in loco Choban-Yatak dicto, in margine dumeti (*Hypericum calycinum*, alii), ca. 250 m (11. II. — No. 760).

*Androsace villosa* L. var. *dasyphylla* (Bunde) Karel et Kiril. (= var. *congesta* Boiss.) — Pax u. Knuth, l. c. p. 182. — Paphlagonia: in cacumine montis Büyük-Ilgaz-Dagh, ca. 2500 m (24. VII. — No. 343).

*Primula acaulis* (L.) Hill var. *rubra* Sibth. et Smith (= *P. acaulis* var. *rosea* Boiss.). — Pax u. Knuth, l. c. p. 55. — Circa Byzantium: supra pagum Sari-Yar, in collibus argillosis, juxta rivulum, fl. (2. III. — No. 803). — Bithynia: circa Hendek, in valle Ulu-Dere, in praeruptis argillosis ad rivulum, fl. (3. II. — No. 742). In valle Bichli-Dere (jugum Kurmaly-Dagh), in declivi occidentali montis Geuk-Tepe, in fageto, ca. 300 m, fol. (30. VI. — No. 145). — Paphlagonia: in declivi orientali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m, fol. (28. VII. — No. 908).

*Primula auriculata* Lam. — Paphlagonia: in declivi boreali montis Kush-Tepe (jugum Ilgaz-Dagh), in prato humido haud procul a cacumine, ca. 2120 m, gregatim (26. VII. — No. 373).

### *Ebenaceae.*

*Diospyros Lotus* L. — Paphlagonia: supra oppidulum Ineboli, arbor alta in horto (9. VIII. — No. 692).

### *Aquifoliaceae.*

*Ilex Aquifolium* L. var. *angustifolium* Hohenacker — Enum. Pl. Talysch. p. 89 in Bull. Soc. Nat. Mosc. III. 1938, p. 319. — Bithynia: circa Hendek, in latere vallis Ibrik Dere, inter novellas *Fagos* et *Quercus*, ca. 250 m rarior (31. I. — No. 732); ibidem, inter fruticeta *Rhododendri*, in valle Ulu-Dere, ca. 370 m (3. II. — No. 740): ibidem, in latere boreo-orientali vallis Su-Atak-Dere (in monte Salman-Tepe), in fageto una cum *Rhododendris*, ca. 553 m, frequentior (6. II. — No. 756); ibidem, sub cacumine montis Cham-Dagh, juxta fontem, ca. 800 m (14. II. — No. 774); ibidem, in latere vallis Isak-Oglu-Dere, in fageto, ca. 300 m (27. VI. — No. 123).

### *Oleaceae.*

*Olea europaea* L. — Circa Byzantium: supra pagum Sari-Yar, in declivi collium ad meridiem spectantium. Culta (16. VIII. — No. 819).

— Paphlagonia: prope Ineboli. in macchia litorali (8. VIII. — No. 640).

*Olea europaea* L. subsp. *silvestris* (Hiller) Rouy (= *Olea Oleaster* Hoffm. et Link.). — Ins. Prinkipo: in parte boreo-occidentali insulae, in macchia fruticeta ca. 3 m alta efficiens. fr. (26. II. — No. 802); ibidem, sine fructibus (26. II. — No. 814).

*Phillyrea latifolia* L. var. *media* (L.) C. K. Schneider — Ill. Handb. Laubholzk. II. 1912, p. 788. — Circa Byzantium: supra pagum Sari-Yar, in macchia in declivi collium Bosporum versus, alt. 60 ad 180 m (25. I. — No. 809). — Ins. Prinkipo: in macchia, una cum *Cisto, Erica, Arbuto,* aliis (26. II. — No. 801). — Paphlagonia: prope Ineboli, in macchia litorali (8. VIII. — No. 486). Prope Zunguldak, in macchia (11. VIII. — No. 639).

Although I have classified all my specimens with *Ph. latifolia* var. *media*, I must state that those from the vicinities of Constantinople (from Sari Yar and the island of Prinkipo) show in their leaves intermediate characters between var. *typica* and var. *media*. Especially interesting are the specimens from the island of Prinkipo, for — originating from one and the same shrub — they have fertile twigs with quite typical leaves of *Ph. media*, and sterile twigs — with no less typical leaves of the variety *typica*.

*Ligustrum vulgare* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia juxta viam (12. VII. — No. 24). — Bithynia: circa Hendek, in sepe viva viali, una cum *Rubis* (1. II. — No. 709); ibidem, inter fruticeta vialia (7. II. — No. 724). Prope pagum Bichki Dere (in radicibus jugi Kurmaly Dagh), inter fruticeta vialia (29. VII. — No. 139). — Galatia: supra oppidulum Arab, ad superiorem cursum rivuli Yaila Chai (mons Eldiven Dagh), inter fruticeta ad rivulum, ca. 1450 m (18. VII. — No. 870).

*Ligustrum lucidum* Ait. — Circa Byzantium: San Stefano, in horto (25. II. — No. 101).

*Fraxinus excelsior* L. — Paphlagonia: inter Küre et Edjevid, in silva mixta in monte Kush-Tepe, ca. 1450 m (5. VIII. — No. 665).

*Jasminum fruticans* L. — Circa Byzantium: in moenibus castelli Yedi-Kule in Stambul haerens (collecta semina, e quibus educta est planta in horto botanico Cracoviensi). — Paphlagonia: inter Tukht et Changri, in declivi orientali collium stepposorum, ca. 1100 m (15. VII. — No. 273).

## *Asclepiadaceae.*

*Vincetoxicum canescens* Willd. — Galatia: supra oppidulum Arab, in declivi montis Eldiven-Dagh, in fissuris saxorum juxta viam, ca. 1225 m (15. VII. — No. 280).

*Vincetoxicum fuscatum* Rchb. — Paphlagonia: prope pagum Yailadjik, in latere occidentali vallis Ilgaz-Su, in pineto, substrato schistoso, ca. 1150 m (25. VII. — No. 354).

*Cynanchum acutum* L. — Paphlagonia: inter oppidum Tashköprü et pagum Kuru-Chai, in pariete stepposo versus viam, copiose (3. VIII. — No. 419).

## *Gentianaceae.*

*Centaurium umbellatum* Gilib. (= *Erythraea Centaurium* Pers.). — Bithynia: circa Hendek, inter viculos Sheklar et Ermeni-Djedjid, in declivi meridionali montis Cham-Dagh, in locis apertis prope quercetum, ca. 200 m (27. VI. — No. 11); ibidem, in declivi montis Yilman (vallis Ulu-Dere), in querceto exciso, ca. 450 m, specimen unicum (25. VI. — No. 93).

*Gentiana verna* L. β. *alata* Griseb. — Paphlagonia: sub cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2500 m (26. VII. — No. 951).

*Gentiana asclepiadea* L. — Bithynia: in valle Bichki-Dere (jugum Kurmaly-Dagh), in declivi montis Geuk-Tepe, in fageto, ca. 300 m, fol. (30. VI. — Non lecta). — Paphlagonia: inter Edjevid et Küre, in declivi boreali montis Kush-Tepe, in silva mixta, fol. (5. VIII. — Non lecta).

*Gentiana cruciata* L. — Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in monte Khadji-Aghach, in silva *Pini nigrae*, ca. 1500 m, rara (1. VIII. — No. 404).

## *Convolvulaceae.*

*Calystegia silvestris* Röm. et Schult. (= *Convolvulus silvaticus* Wald. et Kitaib.). — Bithynia: circa Hendek, in valle Ulu-Dere (in ostio vallis Ohlamurluk-Dere), inter fruticeta densa *Pruni Laurocerasi*, *Rhododendri*, *Sambuci Ebuli*, aliorum, ca. 370 m (23. VI. — No. 52); ibidem, inter fruticeta juxta rivulum, copiosissime (24. VI. — No. 84).

## *Borraginaceae.*

*Heliotropium suaveolens* M. B. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in cacumine depasto in stepposis, ca. 950 m (5. VII. — No. 155).

*Anchusa ochroleuca* M. B. β *canescens* Boiss. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in stepposis saxosis, ca. 900 m (5. VII. — No. 152).

*Trachystemon orientale* D. Don (= *Psilostemon orientale* L.). — Bithynia: circa Hendek, in valle Isak-Oglu-Dere (in monte Kurt-Dagh), in aqua stagnosa prope rivulum, ca. 200 m, fol. (11. II. — No. 704): ibidem, fol. (27. VI. — No. 695); ibidem, in monte Yilman (vallis Ulu-Dere), in querceto, ca. 450 m, frequentior (25. VI. — No. 95). — Paphlagonia: inter Küre et Edjevid, in silva mixta in monte Kush-Tepe, ca. 1450 m (5. VIII. — Non lectum).

***Onosma Briquetii*** Czeczott (Pl. XXXV. Fig. 1) — l. c. p. 42.

Sectio: *Asterotricha* — Boiss., Fl. Or. IV, p. 196.

Planta perennis, basi suffruticosa, ramos breves steriles, dense foliatos, caules floriferos, superne paniculatos, emittens. Caules 20—35 cm alti, adscendentes, conniventes, numerosi, setis sparsis adpressis, pube brevi intermixta, obsiti. Folia inferiora oblongo- vel anguste lineari-spathulata, obtusa, in petiolum attenuata, superiora sessilia, anguste lanceolata, apice acuta, utrinque cinereo-subsericea, setis densis, adpressissimis e tuberculo stellato ortis; bracteae anguste lineares. Racemi fructiferi demum elongati. Calyx (11)—15—(20) mm longus, adpressissime setosus, fere ad basin usque quinquepartitus, laciniis angustissime linearibus 1—1,5 mm latis, acutis, apicem versus subpatule hirsutis; calyx tempore fructificationis accretus, inferne angustatus, basi 5-angulatus, laciniis ad dorsum costa prominula percursis. Corolla clavata, ochroleuca, 22—27 mm longa, 5 (7) mm lata, adpresse velutina, calyce duplo vel tertia parte longior, dentibus late triangularibus, nectario glabro, antheris apice vix exsertis, parte filamenti libera 3—4 mm longa, anthera dimidio usque breviore: nuculae glabrae, nitidae, oblongae, carinato-rostratae.

Paphlagonia: supra oppidulum Tukht, loco Chirchir-Bunar dicto, in montosis stepposis, ca. 1550 m (12. VII. — Nr. 212). Inter oppidum Changri et pagum Inekeui (ad fl. Devrez-Chai), in declivibus montis Akhlat-Dagh, loco Karavan-Sarai dicto, ca. 1368 m (20. VII. — No. 927, Pl. XXXV, Fig. 1). In jugo Ilgaz-Dagh, in declivi viali ad orientem spectante, inter plantas stepposas in regione pinetorum et abietetorum, ca. 1450 m (24. VII. — No. 366).

I place here also the following specimens: "Anatolia, pr. Boli" lg. Wiedemann a. 1863; No. 3952 and No. 4222, Sintenis, "Tossia, in collibus" (under *Onosma flavum* Lehm., det. Haussknecht);

No. 224 and 225, Wiedemann, from Merziwan and Tokat (under *O. Isauricum* Boiss.).

Our new species is most closely related to *O. isauricum* Boiss. The distributional and taxonomic differences are as follows: although both species are peculiar to Central Anatolia, yet *O. Briquetii* is to be found in the northern part of it, *O. isauricum* — in the southern and middle part. (Heldreich collected it between Karaman and Ermenek, Andrasovszky — near Konia, Balansa — in Cappadocia, near Cesarea and Bereketly). The cauline leaves in *O. Briquetii* are narrow, lanceolate with an acute apex, in *O. isauricum* oblongo-spathulate, obtuse. The former differs also by its narrower divisions of the calyx, which is hispidulo-villose (not velutino- and sericeo-pilose) and by its glabrous corollas. In the latter respect it approaches *O. tauricum* Pall. (= *O. stellulatum* W. K. γ *angustifolium* Boiss.), from which it is distinguished, however, by the whitish, instead of dark grey appearance (in sicco), by the patent (not adpressed) hairs of the stem, by the much shorter basal leaves, not curved bracts, shorter corollas and so on.

*Onosma armenum* DC. — Paphlagonia: inter oppidum Changri et pagum Inekeui (ad fl. Devrez-Chai), sub cacumine montis Akhlat-Dagh, in loco Karavan-Sarai dicto, in stepposis, ca. 1368 m (20. VII. — No. 921).

*Alkanna orientalis* L. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in stepposis saxosis, ca. 900 m, deflorescens (5. VII. — No. 166). — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in collibus stepposis, ca. 1550 m (14. VII. — No. 218).

*Myosotis silvatica* Hoffm. — Paphlagonia: in declivi montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m (28. VII. — No. 909).

*Mattiastrum paphlagonicum* Bornm. — J. Bornmüller, 12, p. 69. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in declivi meridionali collium stepposorum, ca. 1500 m, rarum (12. VII. — Nr. 213).

This specimen has been determined from the description only. I referred my plant at first to *M. erysimifolium* (Boiss.) Brand, but I see now that it agrees better in its characters with the species of Bornmüller. Only the number of flowers (in my case — of fruits) in inflorescences is smaller: 6—11 (instead of 12—15).

## *Scrophulariaceae.*

*Verbascum speciosum* Schrad. — Paphlagonia: supra oppidulum Tukht, in declivi boreali montis Bokly-Tepe, in prato subalpino per stationem pecoris tempore mercatus periodici fecundato, copiosissime, ca. 1700 m (14. VII. — No. 233).

*Linaria cordifolia* Desf. — Paphlagonia: in jugo Ilgaz-Dagh, in declivi viali ad orientem spectante, inter plantas stepposas in regione pinetorum et abietetorum, ca. 1540 m (24. VII. — No. 362). Prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere vallis Chamkeui-Su, inter fruticeta *Quercuum, Juniperorum* et *Pini nigrae*, ca. 850 m (31. VII — No. 614).

*Scrophularia canina* L. — Circa Byzantium: supra pagum Sari-Yar, in margine macchiae juxta viam, gregatim (12. VI. — No. 28).

*Digitalis ferruginea* L. — Bithynia: circa Hendek, in valle Ulu-Dere, in latere argilloso supra fossam irrigatoriam, fol. (5. II. — No. 741). — Paphlagonia: prope vicum Djazoglu, in valle Chamkeui-Su, in pratulis humidis ad rivulum, ca. 800 m (1. VIII. — No. 402); ibidem, in silva *Pini nigrae* montis Khadji-Aghach, loco Yaila dicto, prope tuguria pastorum, ca. 1550 m (1. VIII. — No. 621).

*Digitalis orientalis* Lam. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in stepposis saxosis, ca. 950 m, rarior (7. VII. — No. 172). — Paphlagonia: supra oppidulum Tukht, loco Chirchir-Bunar dicto, in declivi meridionali collium stepposorum, substrato calcareo et marga, ca. 1500 m, frequentior (12. VII. — No. 211). — Prope pagum Yailadjik, in latere austro-occidentali vallis Ilgaz-Su, ca. 1100 m, abunde (23. VII. — No. 359).

*Veronica Anagallis* L. var. *anagalliformis* Boreau. — Flore du Centre de la France, 3 ed. I, 1857, p. 489. — Paphlagonia: supra oppidulum Tukht, in angustiis ad radices montis Bokly-Tepe, sub cataracta, ca. 1600 m (13. VII. — No. 239).

*Veronica Fuhsii* Freyn et Sint. β *alpina* Freyn et Sint — J. Freyn. Plantae novae Orientales. III. Ö. B. Z., vol. XLIV, 1894, p. 325. — Paphlagonia: in declivi meridionali montis Büyük-Ilgaz-Dagh, in pineto, ca. 2100 m, vulgaris (24. VII. — No. 910).

My plant was collected in the same locality, from which Sintenis brought his type specimens. Freyn gives for the variety *alpina* "glabra vel subglabra", my specimen, however, is distinctly crispate pubescent.

*Melampyrum arvense* L. β *elatum* Boiss. — Paphlagonia: circa Edjevid, in declivi austro-orientali collium propinquorum, in pineto

*Abiete* admixta, ca. 1100 m, abunde (6. VIII — No. 646). Inter Küre et Edjevid, in monte Kush-Tepe, in pratulo silvatico depasto, ca. 1350 m (5. VIII — No. 451).

*Pedicularis Wilhelmsiana* Fisch. — Paphlagonia: sub cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2300 m (26. VII — No. 952): in declivi orientali montis Büyük-Ilgaz-Dagh, in pineto, ca. 1700 m (28. VII. — No. 937).

## *Acanthaceae.*

*Acanthus hirsutus* Boiss. — Galatia: inter pagum Ravly et oppidum Kaledjik, in transitu montium inter fluvios Sakaria et Kizyl-Irmak, in collibus stepposis, ca. 1300 m (10. VII. — No. 185). — Paphlagonia: inter oppidum Changri et pagum Inekeui (ad fl. Devrez-Chai), sub monte Akhlat-Dagh, prope aedificia, ca. 1465 m (21. VII. — No. 318).

## *Globulariaceae.*

*Globularia trichosantha* Fisch. et Mey. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in fissuris saxorum collium stepposorum, ca. 1550 m (14. VII — No. 223): ibidem, in declivi saxoso montis Bokly-Tepe, ca. 1750 m (13. VII. — No. 227).

## *Labiatae.*

*Lavandula Staechas* L. — Ins. Prinkipo: in macchia et in pineto (*Pinus Brutia*), frequentior (26. II. — No. 806).

*Mentha silvestris* L. var. *incana* Boiss. herb. (= *M. mollissima* Borck.). — Paphlagonia: prope pagum Kuru-Chai (inter Sinopen et Tashköprü), in fossa, ca. 600 m (3. VIII. — No. 435).

*Mentha silvestris* L. (= *M. longifolia* Huds.) var. ? — Paphlagonia: circa Edjevid, prope fossam irrigatoriam, ca. 1100 m (6. VIII. — No. 465).

*Thymus punctatus* Visiani[1]) — Memorie dell'Istituto Veneto I, 1843, p. 43, tab. 2 f. 1. — Paphlagonia: in cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m (26. VII. — No. 953).

"Hierzu rechne ich als var.: *T. sipyleus* Boiss., *affinis* Vis., *squarrosus* Fisch. et Mey, *rigidus* Schott et Kotschy".

*Thymus parviflorus* C. Koch — Linnaea vol. 21, 1848, p. 666 — var. *ponticus* Ronniger. — Paphlagonia: supra vicum Djazoglu

[1]) For the determinations of *Thymus* and notes to them I am obliged to Dr. K. Ronniger (Vienna).

(inter Sinopen et Tashköprü), in cacumine montis Khadji-Aghach pineto circumdato, ca. 1760 m, abunde (1. VIII. — No. 409).

"Wurde auch von Handel-Mazzetti 1907 bei Trapezunt gesammelt (als *T. praecox* Opiz publiziert). Bei dem typischen *T. rariflorus* sind die oberen Kelchzähne nicht gewimpert, bei var. *ponticus* sind die oberen Kelchzähne gewimpert."

*Calamintha grandiflora* L. (= *Satureja grandiflora* [L.] Scheele — Hegi. Ill. Fl. Mitt. Eur. V, 4, p. 2288). — Bithynia: circa Hendek. in umbrosis silvis mixtis in monte Cham-Dagh (non lecta). — Paphlagonia: in pineto in declivi montis Büyük-Ilgaz-Dagh, ca. 1700 m (28. VII. — No. 913). Supra vicum Djazoglu (inter Sinopen et Tashköprü), in pineto montis Khadji-Aghach, alt. 1350 m et supra (1. VIII. — No. 405).

*Calamintha Nepeta* L. (= *Satureja Calamintha* [L.] Scheele subsp. *Nepeta* [L.] Briq. em. Gams — Hegi, l. c. p. 2292). — Circa Byzantium: supra pagum Rumeli-Kavak, in macchia (16. VIII. — No. 892).

*Zizyphora clinopodioides* M. B. var. ? — Paphlagonia: supra oppidulum Tukht, in declivi meridionali montis Bokly-Tepe, ca. 1650 m (13. VII. — No. 231).

This very much branched lowly plant comes nearest to the var. *serpillacea* Boiss., but differs in its general appearance and very short indumentum of the calyx.

*Zizyphora capitata* L. — Paphlagonia: in jugo Ilgaz-Dagh, in declivi viali ad orientem spectante, inter plantas stepposas in regione abietetorum et pinetorum, ca. 1450 m (24. VII. — No. 363).

*Salvia grandiflora* Ettling. — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere austro-orientali vallis Chamkeui-Su, inter fruticeta *Quercuum, Juniperi* et *Pini nigrae*, ca. 850 m (3. VIII. — No. 413).

*Salvia cryptantha* Montb. et Auch. — Paphlagonia: supra oppidulum Tukht, loco Chirchir-Bunar dicto, in declivi collium stepposorum, in angustiis saxosis, ca. 1500 m, rara (12. VII. — No. 205).

*Salvia Sclarea* L. — Galatia: circa Arab, prope agros cultos, in vervactis et juxta viam vulgaris, ca. 1300 m (16. VII — No. 285). — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere austro-orientali vallis Chamkeui-Su, juxta tramitem, ca. 850 m (31. VII. — No. 617).

*Salvia candidissima* Vahl. — Galatia: inter Changri et Arab, in declivi montis Eldiven-Dagh, juxta viam inter plantas stepposas, una cum *Salvia cyanescente*, ca. 1200 m (19. VII. — No. 314).

*Salvia cyanescens* Boiss. et Bal. — Galatia: inter Changri et Arab. in declivi montis Eldiven-Dagh, juxta viam inter plantas stepposas, una cum *Salvia candidissima*, ca. 1200 m (19. VII. — No. 896). — Paphlagonia: prope pagum Kasandjik, in latere meridionali vallis Ilgaz-Su, in utroque latere viae a Changri ad Kastamuni ducentis, ca. 1200 m, gregatim (24. VII. — No. 959).

*Salvia virgata* Ait. — Paphlagonia: circa Edjevid, in limite inter agros cultos, ca. 1150 m (6. VIII. — No. 463).

*Nepeta nuda* L. var. (nov.) ***ilgazensis*** Czeczott. — Foliis oblongo-lanceolatis, minute pubescentibus, floribus parvis, calyce patule hirsuto, corolla albida.

Paphlagonia: in pascuis alpinis montis Büyük-Ilgaz-Dagh, ca. 2400 m, copiosissime (24. VII. — No. 911).

Intermediate in form between *Nepeta nuda* β *albiflora* Boiss. and *Nepeta marrubioides* Boiss. et Heldr. Similar to the former in the character of the leaves and colour of the flowers, resembles the latter in the white indumentum of its calyx.

*Scutellaria orientalis* L. β. *pinnatifida* Boiss. — Paphlagonia: prope pagum Yailadjik, in latere austro-orientali vallis Ilgaz-Su, in margine praeruptorum inter plantas stepposas, ca. 1150 m (23. VII. — No. 325). In cacumine et sub cacumine montis Büyük-Ilgaz-Dagh, alt. 2350—2500 m (24. VII. — No. 344). Prope vicum Djazoglu (inter Sinopen et Tashköprü), in declivi saxoso inter fruticeta *Juniperi*, *Quercuum* et *Pini nigrae*, ca. 850 m (31. VII. — No. 620).

*Marrubium astracanicum* Jacq. — Paphlagonia: supra oppidulum Tukht, in declivi boreali montis Bokly-Tepe, in prato subalpino per stationem pecoris tempore mercatus periodici fecundato, una cum *Verbasco specioso*, ca. 1700 m, copiosissime (14. VII. — No. 252).

*Sideritis montana* L. var. *comosa* Boiss. — Paphlagonia: supra oppidulum Tukht, in declivi meridionali montis Bokly-Tepe, ca. 1650 m (13. VII. — No. 230).

*Sideritis libanotica* Labill. γ. *linearis* Bth. — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere austro-orientali vallis Chamkeui-Su, ad scorias antiquae fodinae, ca. 850 m (31. VII. — No. 395).

*Stachys lanata* Jacq. — Paphlagonia: supra oppidulum Tukht, in cacumine *Junipero* obsito, monti Panair-Tepe vicino, ca. 1880 m (14. VII. — No. 262). In regione subalpina jugi Ilgaz-Dagh, in declivi ad orientem vergente, prope limitem superiorem silvarum, ca. 1750 m (28. VII. — No. 912).

*Stachys Thirkei* C. Koch. — Circa Byzantium: supra pagum Sari-Yar, in graminosis, vulgaris (12. VI. — No. 44).

*Phlomis armeniaca* Willd. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in stepposis saxosis, ca. 900 m (5. VII. — No. 168). Inter pagum Ravly et oppidum Kaledjik, in transitu montium inter fluvios Sakaria et Kizyl-Irmak, in collibus stepposis, ca. 1300 m (10. VII. — No. 184).

*Teucrium orientale* L. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in fissuris saxorum, ca. 1550 m (14. VII. — Nr. 222).

*Teucrium Chamaedrys* L. — Bithynia: circa Hendek, inter viculos Shekhlar et Ermeni-Djedjid, in margine querceti, una cum *Cisto villoso, C. salviifolio* et *Centaurio umbellato*, ca. 200 m (27. VI. — No. 112); ibidem, in declivi meridionali montium supra Hendek in margine querceti, ca. 400 m (27. VI. — No. 98). — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in fissuris saxorum in declivi meridionali collium stepposorum, ca. 1500 m, frequentior (12. VII. — No. 210). Inter oppidum Changri et pagum Inekeui (ad fl. Devrez-Chai), in declivi montis Ai-Dagh in stepposis, ca. 1305 m (20. VII. — No. 926).

*Teucrium polium* L. var. *lanuginosum* Čelakovsky. — Über einige Arten der Gattung *Teucrium*, Bot. Centralbl. XIV, 1883, p. 152. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in stepposis saxosis, ca. 900 m (5. VII. — No. 158). — Paphlagonia: supra oppidulum Tukht, in declivi meridionali montis Bokly-Tepe, in stepposis saxosis, ca. 1650 m (13. VII. — No. 233).

## *Plumbaginaceae.*

*Acantholimon lycaonicum* Boiss. et Heldr. — Paphlagonia: supra opidulum Tukht, in declivi stepposo montis Bokly-Tepe, ca. 1750 m (13. VII. — No. 884).

*Acantholimon acerosum* Willd. — Paphlagonia: prope vicum Bunarkeui (inter Changri et Tukht), in collibus stepposis, ca. 1250 m (11. VII. — No. 190). Prope pagum Yailadjik, in latere austro-occidentali vallis Ilgaz-Su, inter plantas stepposas, ca. 1100 m (25. VII. No. 958).

*Acantholimon Echinus* L. — Paphlagonia: supra oppidulum Tukht in declivi meridionali collium stepposorum, ca. 1500 m (11. VII. — No. 195).

*Acantholimon* sp. — Galatia: supra oppidulum Arab, in siccis stepposis, in serpentinicis et tufosis (17. VII. — No. 857).

Not matched on account of the insufficiency of the material.

## *Plantaginaceae.*

*Plantago holosteum* Scop. (= *P. carinata* Schrad.)[1]) — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila Chai (mons Eldiven-Dagh), in pineto, ca. 1350 m (18. VII. — No. 858). — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in collibus stepposis, ca. 1550 m, frequens (15. VII. — No. 265). Prope pagum Yailadjik, in latere vallis Ilgaz-Su, inter plantas stepposas, ca. 1130 m (24. VII. — No. 956).

## *Phytolaccaceae.*

*Phytolacca americana* L. (= *P. decandra* L.). — H. Walter, Phytolaccaceae in Engler, Das Pflanzenreich, IV. 83. 1909, p. 52. — Paphlagonia: supra oppidulum Ineboli, in declivi mare versus, inter hortos et agros in macchia (8. VIII. — No. 636).

## *Chenopodiaceae.*

*Chenopodium virgatum* (L.) Jessen (= *Blitum virgatum* L.). — Paphlagonia: circa pagum Yailadjik (vallis Ilgaz-Su), in loco Denir-Djilev dicto, in praeruptis ad rivulum (22. VII. — No. 322).

*Kochia prostrata* (L.) Schrad.? — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in saxosis stepposis, ca. 900 m, rarior (5. VII. — No. 563).

Although my specimens have neither flowers nor fruits and have been much eaten by goats, Dr. Nabělek feels no doubt regarding this determination.

## *Polygonaceae.*

*Rumex nepalensis* Spreng. — Paphlagonia: supra oppidulum Ineboli, in declivi mare versus, in macchia in limitibus inter agros et hortos (8. VIII. — No. 118).

*Rumex scutatus* L. var. *hastifolius* (Bieb.) Koch — Boiss. herb. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in profundis angustiis, in fissuris margarum et saxorum calcareorum, ca. 1400 m (12. VII. — No. 204).

[1]) Determined Prof. R. Pilger (Berlin).

## *Thymeleaceae.*

*Daphne oleoides* Schreb. β *jasminea* Meissn. — Karl Keissler, Die Arten der Gattung *Daphne* aus der Section *Daphnanthes*, Engl. Bot. Jahrb. XXV, 1898. p. 49. — Paphlagonia: in regione subalpina prope cacumen montis Büyük-Ilgaz-Dagh. in pineto inter *Juniperos nanas*, alt. 2100—2500 m (24. VII. — No. 336).

*Daphne pontica* L. — Circa Byzantium: in collibus supra pagos Sari-Yar et Rumeli-Kavak sitis, in macchia, rarior (25. I. — No. 781); ibidem (12. VII. — No. 353). — Paphlagonia: prope limitem superiorem silvarum (pinetorum) montis Büyük-Ilgaz-Dagh, ca. 2200 m (24. VII. — No. 353). Supra vicum Djazoglu (inter Sinopen et Tashköprü), in pineto montis Khadji-Aghach, ca. 1300 m (1. VIII. — No. 618).

In accordance with the Albow's note in "Prodromus Florae Colchicae", p. 210, my specimens originating from a low altitude (vicinities of Constantinople) display thicker and more coriaceous leaves than those collected in the subalpine and alpine regions (in Paphlagonia). The nervation in the leaves from a lower altitude is more distinct and they are shorter and broader. Notwithstanding this I do not feel quite sure that there is sufficient ground for segregating the subalpine plant from the one growing in the lower altitudinal zone as a different species: the break in the vertical distribution mentioned by Albow for Colchis (in the zone from 200 to 1800 m the species is said to be lacking) has not been confirmed for Asia Minor, inasmuch as Dr. Handel-Mazzetti (29, p. 171) and myself collected it in an altitudinally intermediate region[1]). As concerns the colour of the fruits: in the plant from the subalpine region they are unripe. the specimens from near Constantinople are fruitless.

## *Elaeagnaceae.*

*Hippophaë rhamnoides* L. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in profundis angustiis, in calcareis et marga. passim gregatim (12. VII. — No. 206). Ad cursum inferiorem fluvii Ilgaz-Su, densa fruticeta abunde fructicantia juxta viam efficiens (21. VII. — No. 319).

*Elaeagnus angustifolia* L. (= *E. hortensis* M. B.). — Galatia: inter Angora et pagum Ravly, in pago ad fossam irrigatoriam. consita,

[1]) Compare, however, my notes on the distribution of *Daphne pontica* in 18. p. 53.

ca. 900 m (10. VII. — No. 186). Circa Arab, in declivi meridionali montis Eldiven-Dagh, in siccis stepposis, substrato serpentinico, ca. 1300 m (17. VII. — No. 859). — Paphlagonia: supra pagum Inekeui (ad fl. Devrez-Chai), prope antra praehistorica, substrato conglomeratico, ca. 900 m (21. VII. — No. 317). Prope pagum Yailadjik (in valle Ilgaz-Su). ad fossam irrigatoriam. ca. 1100 m (23. VII. — No. 957).

### *Lauraceae.*

*Laurus nobilis* L. — Circa Byzantium: supra pagum Sari-Yar, in declivi collium Bosporum versus. arbor solitaria in macchia juxta viam, ca. 60 m (25. I. — No. 785); ibidem, in fruticetis vialibus (2. III. — No. 805). — Paphlagonia: prope Ineboli, in extremo litore maris (8. VIII. — No. 638). Circa Zunguldak. in macchia (10. VIII. — No. 539).

### *Santalaceae.*

*Thesium divaricatum* Jan. — Paphlagonia: circa Edjevid, in declivi orientali montium, in pineto una cum *Quercu* et *Abiete*, ca. 1100 m (6. VIII — No. 645).

### *Loranthaceae.*

*Viscum album* L. — Bithynia: circa Hendek. prope pagum Kioshk. in pomario in *Pruno domestica* (7. II. — No. 761); ibidem, in declivi montis Yilman (vallis Ulu-Dere), in *Tilia argentea* vetere, 140 cm in circuito complectente. ca. 450 m (25. VI. — No. 86). — Galatia: circa Arab, in valle Yaila-Chai (mons Eldiven-Dagh), in *Piro elaeagrifolia*, ca. 1400 m (18. VII. — No. 860).

*Arceuthobium Oxycedri* DC. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in declivi orientali collium stepposorum. in regione fruticum, ca. 1550 m (14. VII. — No. 220).

*Loranthus europaeus* L. — Bithynia: circa Hendek, in declivi meridionali montis Kurt-Dagh, in querceto. in *Quercibus* veteribus frequens. sine foliis (7. II. — No. 59); ibidem. in declivi meridionali montium, ad *Quercus* abunde (26. VI. — No. 101).

### *Aristolochiaceae.*

*Asarum europaeum* L. β *caucasicum* Duchartre. — Bithynia: circa Hendek. in valle Ulu-Dere, sub *Platanis*, in umbra dumetorum fluviaticorum, ca. 370 m (10. II. — No. 768); ibidem, in fageto in valle Ulu-Dere (26. VI. — No. 121).

*Aristolochia pontica* Lam. — Paphlagonia: inter Küre et Edjevid, in silva mixta in monte Kush-Tepe, ca. 1400 m (5. VIII. — No. 668).

*A. pontica* Lam. has been noted, beyond its Colchic area, only in the Pontus mts. (near Rhizé, Samsun and so on). The occurrence in Paphlagonia extends considerably its area in westerly direction.

## *Euphorbiaceae.*

*Euphorbia palustris* L. — Bithynia: inter Ada-Bazar et Hendek, in valle paludosa fluvii Mudurlu, una cum *Caricibus* typicam societatem efficiens (23. VI. — No. 57).

*Euphorbia Szovitsii* F. et M. — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto, in profundis angustiis, in marga et calcareis substratis, juxta rivulum, ca. 1400 m (12. VII. — No. 207).

*Euphorbia Gerardiana* Jacq. — Papglagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in declivi austro-orientali montis Khadji-Aghach, in pineto, ca. 1400 m (1. VIII. — No. 403), frequens usque ad cacumen — 1750 m.

*Euphorbia tinctoria* Boiss. et Huet. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in stepposis saxosis, ca. 900 m (5. VII. — No. 161).

*Euphorbia amygdaloides* L. — Bithynia: circa Hendek, in parte superiore vallis Ibrik-Dere, in latere arduo angustiarum, in fageto *Quercu* admixta, ca. 450 m, fol. (1. II. — No. 752); ibidem, in lateribus vallis Ulu-Dere, in fageto *Quercu* admixta, ca. 600 m, fol. (3. II. — No. 758); ibidem, in declivi montis Ohlamurluk (vallis Ulu-Dere), in querceto, ca. 520 m, rarior, deflorescens (24. VI. — No. 68). — Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in pineto montis Khadji-Aghach, alt. 1400—1700 m, abunde, deflorescens (1. VIII. — No. 623).

*Euphorbia Myrsinites* L. — Paphlagonia: supra oppidulum Tukht in cacumine montis Panair-Tepe, inter plantas stepposas et silvaticas prope abietetum, ca. 1950 m (14. VII. — No. 248).

The distribution of *E. Myrsinites* as depicted by V. P. Malcev (44, p. 49), does not correspond with the newer data concerning this species: in the more recent part of Herbier Boissier there are specimens from Angora (Bornmüller), Tossia and Elmaludagh (Sintenis), which occurrences, together with the one given by me, make its eastern limit of distribution clear and extend it from the Crimea to Cyprus. I have also seen the specimens of this *Euphorbia* originating from Northern Persia (between Teheran and Kaswin, Bornmüller,

Aschabad — Sintenis). It is not clear to me whether these occurrences represent an isolated partial area, or an extension eastwards of the general area.

### *Moraceae.*

*Humulus Lupulus* L. — Bithynia: circa Hendek, in valle Hussein-Sheikh-Dere, inter fruticeta umbrosa juxta rivulum (non lectum).

*Morus alba* L. — Circa Byzantium: supra pagum Sari-Yar, in horto in collibus (12. VI. — No. 39).

*Ficus Carica* L. — Bithynia: circa Hendek, in valle umbrosa Isak-Oglu-Dere, ad rivulum in silva mixta (*Carpinus, Fagus, Castanea, Ulmus, Salices*) ca. 250 m (non lecta). — Paphlagonia: prope Ineboli, in agro culto in litore maris (8. VIII. — No. 632).

### *Ulmaceae.*

*Celtis australis* L. — In pago Khadji-Vakif (inter Sinopen et Tashköprü), in valle Kuru-Chai, una cum *Moris*, et *Sorbo domestica*, an culta? (3. VIII. — No. 635).

*Ulmus glabra* Hudson (= *U. campestris* L. p. p. — C. K. Schneider, Beiträge zur Kenntnis der Gattung *Ulmus*. Ö. B. Z. LXVI, 1916, p. 21. — Bithynia: inter Ada-Bazar et Hendek, in valle fluvii Sakaria, arbor plerumque deputata (23. VI. — No. 61).

*Ulmus scabra* Mill. (= *U. montana* With. — C. K. Schneider, l. c. p. 21). — Bithynia: circa Hendek, in valle Su-Atak-Dere, in ipso alveo rivuli, ca. 500 m (26. VI. — No. 109). In valle Bichki-Dere (jugum Kurmaly-Dagh), in declivi occidentali montis Geuk-Tepe, in profundis angustiis in fageto umbroso, ca. 300 m (30. VI. — No. 147).

### *Juglandaceae.*

*Juglans regia* L. — Bithynia: inter Ada-Bazar et Hendek, in planitie Ak-Ova, ad viam consita (non lecta). — Paphlagonia: inter Sinopen et Tashköprü, in valle Ajukhlu-Chai (in radicibus montis Khadji-Aghach), in ipso alveo rivuli, spontanea? (Non lecta).

### *Platanaceae.*

*Platanus orientalis* L. — Bithynia: circa Hendek, in valle Ulu-Dere, arbores magnae, solitariae et gregariae in ipso alveo rivuli, alt. 220—400 m, fr. (3. II. — No. 737). — Paphlagonia: circa Ineboli, ad extremum litus maris (8. VIII. — No. 473).

## *Fagaceae.*

Of the three genera of this family — *Quercus*, *Fagus*, and *Castanea* — the most important part in the vegetation of Asia Minor indisputably belongs to the genus *Quercus*. Oaks constitute the pure and mixed forests in the mountains of Northern and Southern Anatolia, in Kurdistan and Transcaucasia[1]); in the shrub form pure Querceta occupy wide tracts of the peninsula, and intermixed with other species of shrubs they are to be met with regularly throughout Central Anatolia between the steppe and forest regions, representing a special altitudinal zone.

The identification of the *Quercus* materials caused me more difficulty than that of any other genus. Acorns are often not to be found in Asia Minor over wide spaces, it is therefore of special importance that leaves should be most carefully collected. Owing to the great fluctuational changes to which the leaves are subject in most species of oaks, it is required for their right classification that at least several twigs of the same individual be taken (to display the range of fluctuation), that many specimens be collected from the same locality and, lastly, from different localities of the whole area. We are as yet very far from having in our Western European herbaria sufficient and well collected materials of oaks from Asia Minor. My oaks were also collected in an unsatisfactory way, but the observations made in the field gave me much help.

The magnificent work of Kotschy, "Die Eichen Europas und des Orients", important as it is, does not exhaust the forms (species. subspecies, and so on) growing in Asia Minor and the neighbouring countries. The author realised this himself and one finds in the herbaria many of his specimens, bearing on the labels "Revisio generis *Quercus*", under the names of new species never described by him. Wenzig in "Die Eichen Europas, Nordafrikas und des Orients" (89), who critically revised the original collection of Kotschy, instead of improving the matter, obscured it in many cases still further by identifying some of the easily distinguishable new forms with already existing species.

It is a fact that the oaks of the group *Q. Robur* L. sensu lato are represented in the Nearer East by numerous species, subspecies

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[1]) See Part I of this work and: H. Handel-Mazzetti, 30, p. 51—53; Fr. Nábělek, 51, pars IV, p. 21—23; A. Grossheim, 28, p. 10—18.

and entities of minor rank[1]). This is in a causal relation 1) with the great variety of orography in the countries referred to (Asia Minor, Kurdistan, Persia, Transcaucasia, Armenia and so on), allowing the existence of numerous smaller regions with very contrasting climates and 2) with the long developmental history of the vegetation of this region, uninterrupted by glaciation. Such a state of things agrees well with the conception of the existence of one of the centres of origin of *Quercus* in the eastern part of the Mediterraneïs (in the sense of Engler). The clarification of the taxonomic position of the forms mentioned will not be effected by studying the small scraps at present in our museums and the disposing of them in the frame of one or other of the species existing in Europe. In the group *Robur* there is a tendency to throw them in a heap either with *Q. sessiliflora* or *Q. pedunculata,* both having their chief abode in the vast spaces of Europe which were once glaciated. This suggests that they represent much younger species than those of Asia Minor. A careful study in the field of the ecology of these species, their participation in this or that community, their taxonomy on the basis of such an amount of material as will display the whole range of variability (especially as regards the leaves), lastly the establishment of what was meant by the older authors when describing this or that species, viz. determination from the type specimens, this is the only way out of the maze of the innumerable forms of oaks in the Nearer East. The last condition proves to be none of the easiest: in numerous instances the same forms have been described independently by Russian botanists: Steven, Medwedew, Woronow for the Caucasian countries, by Kotschy, Koch, Boissier, Lindley, Wenzig — for Asia Minor, Kurdistan, and Persia, lastly, quite recently, by Turrill and Stefanoff for the Stranja mts. in the Balkan Peninsula[2]).

[1]) Some of the more important of these are: *Quercus Haas* Ky., *Q. pedunculiflora* C. Koch, *Q. longipes* Stev. and *Q. kurdica* Wenzig (synonyms?) — all, apparently, related to *Q. pedunculata* Ehrh.; *Q. mannifera* Lindl., *Q. iberica* Stev. near to *Q. sessiliflora* Salisb.; *Q. dschorochensis* C. Koch, *Q. pseudodschorochensis* Ky. (perhaps synonyms), *Q. colchica* (Ky.) Cz. also related to *Q. sessiliflora* Salisb.; *Q. Hartwissiana* Stev. (= *Q. armeniaca* Ky.) by the long petiolate leaves and stalked fruits taking intermediate position between *Q. sessiliflora* and *Q. pedunculata.*

[2]) While my notes on the Turkish oaks had been awaiting publication for five years, two monographs on the genus *Quercus* began to appear simultaneously: one by A. Camus (Paris), the other by O. Schwarz (Berlin). The first is as yet of no great use for our purpose on account of the lack of text, the second has rendered

*Quercus pedunculiflora* C. Koch (= *Q. Haas* Ky. var. *atrichoclados* Borb. et Bornm.). — O. Schwarz, Monographie der Eichen Europas und des Mittelmeergebietes, I, 1937, p. 112. — Paphlagonia: in ditione oppiduli Tukht, ingens arbor solitaria juxta alveum siccum rivuli, in circuitu ca. 3 m, ca. 1250 m (15. VII.— No. 266*). Inter Kastamuni et Tashköprü, arbor solitaria in stepposis prope fluvium Geuk-Irmak, ca. 750 m (29. VII. — No. 391). In pago Kuru-Chai (inter Sinopen et Tashköprü), in horto (3. VIII. — No. 504).

In specimens No. 266 and 391 the villosity of the lower surface of the leaves along the nerves is of a slightly yellowish hue (influence of *Q. Haas* Ky?).

*Quercus Hartwissiana* Stev. — Bull. Soc. Imp. Natur Moscou, XXX, No. 1, 1857, p. 387 (= *Q. armeniaca* Ky. = *Q. stranjensis* W. B. Turrill). — Paphlagonia: In collibus circa Edjevid, in margine pineti, aliquot abunde fructicantes arbores, ca. 1150 m (6. VIII. — No. 546).

Thanks to the kindness of my Russian and Bulgarian colleagues I am in possession of typical specimens of what are considered as *Q. Hartwissiana* Stev. and *Q. stranjensis* W. B. Turrill. As concerns *Q. armeniaca* Ky., I have seen several specimens referred to this species by Wenzig and Handel-Mazzetti, exactly matching those which I collected myself in Asia Minor. The synonymy of *Q. Hartwissiana* with *Q. armeniaca* has been established by the Russian

us great service, since the author works on much the same lines as we (the study of the variability, the due evaluation of the leaves of oaks for taxonomy, till now undervalued, genetic principles and so on), and has had the opportunity of studying the Asia Minor oaks on the spot, in Anatolia. Furthermore, we have quite recently (in the spring of 1937) had opportunity discussing together my determinations in the presence of the very specimens (unfortunately not of all). The far greater knowledge of the genus of Dr. Schwarz led me to change some of my previous determinations (marked with an asterisk), in other cases I was glad to have his approval, but in a few instances there arose a diversity of opinions, which will undoubtedly be smoothed away at some future time, when more abundant materials will have been brought from the regions concerned, and the conditions of growth of the disputed forms will have been studied more thoroughly on the spot. This is the case of the species *Quercus colchica* (Ky.) Cz., of the systematic position of *Q. pseudodschorochensis* Ky., the scope of the species *Q. dschorochensis* C. Koch.

In connection with Dr. Schwarz' publications on oaks I have omitted the descriptions of some new forms (of *Q. Cerris*, *Q. infectoria*), these having been given by him already. In other cases, however, I thought it useful to expose in extenso my critical views on some oaks, which I have reached quite independently and perhaps even earlier than my respected colleague (see the notes on *Q. Hartwissiana* Stev.).

botanists Medwedew, in "Duby Kawkaza" (49, p. 10) and Grossheim in "Flora of Caucasus" (II, p. 22). *Q. stranjensis* W. B. Turrill, suggested by the author himself as possibly representing a hybrid of *Q. pedunculata* Ehrh. with *Q. sessiliflora* Salisb., is according to Stefanoff closely related to *Q. Hartwissiana* and to *Q. armeniaca*. Yet he does not identify these three oaks[1]).

The differences which apparently exist between *Q. stranjensis* and the other two species mentioned proved of no importance when a greater number of specimens were compared. It is true that some of the Stranja specimens display greater dimensions of the leaves (up to 18 cm in length), while in none of those of "*Q. Hartwissiana*" or "*Q. armeniaca*" seen by me do they surpass 14 cm. But the North-African *Q. Mirbeckii* Durieu, the resemblance to which of *Q. stranjensis* has been noticed by Stefanoff, possesses almost the same varietal range in the dimensions and forms of leaves, having individuals with leaves 20 cm long, while in others they measure but 6 cm.

Another point, which according to Stefanoff distinguishes *Q. Hartwissiana* Stev. from *Q. stranjensis* Turrill — triangular acute lobes — proved to be peculiar to most of the specimens seen by me from the whole distributional area of *Q. Hartwissiana*. The Stranja specimens exhibit beside the forms with acute triangular lobes others in which they are quite rounded. The same range of variability is displayed by the morphological characters of the leaves in the region of Lazistan (Pontus mts.): No. 245, Bourgeau, "Pr. Trebizonde" has leaves with prominently rounded lobes, quite identical with those of the specimens from the Stranja mts. "ad fl. Resvaja, pr. pagum Kladara" Stojanoff, 1931, and "pr. vicum Marsevo in Strandja" T. Ivanoff, 1929. One twig No. 220, Handel-Mazzetti "prope Trapezuntum" bears round-lobed leaves, others — acutely dentate, and these latter are quite similar to the type of Steven, which I found in the Museum of Natural History in Vienna. In No. 1842, Krause, from near Kerasun, some of the lobes are rounded, others — more or less acute. My specimen from Paphlagonia has triangular acute lobes.

The deepness of the incisions is also highly variable: from 2—3 mm to 10 mm. In exceptional cases, e. g. in the specimens collected by

[1]) See Stefanoff, 74, p. 63. The same author in a more recent publication, when identifying the Pliocene leaf impressions from Podgumer, *Q. roburoides* Bér., with the *Q. stranjensis* Turrill, expressed the view that the latter species may represent a local form of *Q. armeniaca* Ky. or even be identical with it (76, p. 42).

Kikodze near Ozurgety in Transcaucasia, 1914, they even reach 14 mm[1]). Remarkable in this respect are the specimens from the Stranja mts. "ad fl. Velika prope pagum Stoilovo", Stoyanoff, 1931, resembling by their large leaves and deeply cut teeth (forma *grosseserrata*!) No. 990, S. Turkiewicz, 1914, from the district of Artwin in Russian Lazistan (Herb. Czeczott) and No. 7477, Sintenis, 1894, from Matardjik near Trebizond.

The above examples clearly show that acutely dentate forms and round lobed ones are distributed throughout the region from the Caucasian countries through the whole of Northern Asia Minor to the Stranja mts. and there is no need to create special varieties[2]).

The number of side-veins is mostly 9—10, but in the longest leaves they number 14—16, which is never met with in *Q. sessiliflora* Salisb. The lack of intercalary nerves is almost constant, and when they are present suspicion is aroused, as also by other minute features, of their being hybrids. Perhaps Kotschy's specimen in the Natural History Museum in Vienna, referred to *Q. armeniaca* by Wenzig (with No. and locality not marked), is such a hybrid. It may be mentioned that its leaves are quite identical with those from Kalovo in the Stranja, placed by Stefanoff (75, p. 70) among the intermediate forms between *Q. sessiliflora* and *Q. stranjensis*. Both are characterised by the presence of intercalary nerves and pedunculate fruits.

The presence or absence of auricles at the base of the leaves is, in my opinion, of no taxonomic value in *Q. Hartwissiana* Stev., for cuneate leaves are as often met with as auricled ones.

Long pedunculate acorns are a feature rightly considered of primary importance when distinguishing the species mentioned. Yet the length of peduncle is also subject to great varietal changes and one may meet forms, which combine typical, hardly crenate leaves, devoid of any intercalary nerves, characteristic of *Q. Hartwissiana*, and others with peduncles equal in length to the leaf-stalks or even a little shorter than the petioles (compare No. 220, Handel-Mazzetti and No. 646, Bourgeau — both in the Natural History Museum,

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[1]) Medwedew, too, mentions forms, from the Oblast' Kuban, with acute elongated lobes (50, p. 13).

[2]) In extreme cases, however, it would, perhaps, be useful to distinguish f. ***grosseserrata:*** forma foliis elongatis, nervis lateralibus approximatis, numerosis (ad 16), lobi dentiformi, acuti (as in the specimen "ad fl. Velika" from the Stranja).

Vienna), yet almost constantly one finds on the same twigs long pedunculate fruits.

Medwedew (50, p. 12) distinguishes two forms of *Q. Hartwissiana*: a. *typica*, with fruits not surpassing 8‴ (17 mm) in length, and b. *macrocarpa*, with large fruits: cupula 4—6‴ in height, 7—9‴ in diameter, acorn 12—18‴ (25—38 mm) in length, 5—7‴ in breadth. Owing to the lack of acorns on many of the specimens seen by me or the very young state of the fruits, I am not able to establish the presence of these two varieties throughout the whole area of *Q. Hartwissiana*, but judging from the large dimensions of the cupula in some of the Stranja mts. specimens, I presume that var. *macrocarpa* occurs also in that region.

It should be noticed here that the scales of the cupula in *Q. Hartwissiana* are broad, differing in this respect from the scales of *Q. sessiliflora* Salisb. and approaching *Q. pedunculata* Ehrh.

The degree of hairiness of the under surfaces of the leaves is variable: Steven's specimens in the Museum, Vienna, are quite devoid of stellate hairs and only bear a few hairs along the median nerve, near its basal part. Most of the specimens, however, have on the under surface minute stellate hairs (visible with a magnifying glass only) and longer hairs concentrated along the middle and side nerves in the basal part of the leaf[1]).

On the whole *Q. Hartwissiana* Stev. exhibits the same range of variability as *Q. mongolica* Fisch., *Q. macranthera* Fisch. et Mey. and especially *Q. Mirbeckii* Durieu[2]). What makes their leaves resemble each other is the presence near the apex of much smaller lobes than those in the middle part. They are often hardly notched and look

[1]) In 1936 the present writer had an opportunity of making observations and personally collecting specimens from a greater number of trees of this species growing in the valley of the river Velika in the Bulgarian Stranja. She hopes to give some additional notes on *Q. Hartwissiana* Stev. when these materials will have been sifted.

[2]) When consulting the material extant in the Natural History Museum in Vienna of *Q. Mirbeckii* Durieu I came across an interesting sheet: "No. 4807, *Quercus carpinifolia* Sennen. Barcelone, barranco du Rabassalet. 20. IX. 1923." It will be hardly a mistake to refer it to *Q. Mirbeckii* Durieu. Brother Sennen informs me that he has collected leaves only. Should my assumption prove correct, then *Q. Mirbeckii* — undoubtedly an old species (known in related forms from several fossil floras of South-Western Europe) — will not be the sole relict species in the vicinity of Barcelona: in the same district has been found growing, again by Brother Sennen, *Carex Grioletii* Roem. et Schult., notable for its discontinuous distribution throughout the Old Mediterranean Region.

blunted[1]). I do not, however, suppose, that there is a close relationship between the latter and *Q. Hartwissiana* (still less between it and the two other species mentioned). The similarity of varietal range is another instance of Vavilov's law of homologous variation (86 and 5).

*Q. Hartwissiana* is an old species, the existence of which can be traced as far back as the Lower Pliocene. It has been recognized by Stoyanoff and Stefanoff in the Pliocene deposits of Kurilo near Sofia[2]). We may expect its presence in the mountains of Southern Asia Minor (especially in the Amanus mts.), where so many South-Euxine species have been found growing disconnected from their area in Northern Anatolia and Colchis.

Steven described his *Q. Hartwissiana* in 1857. Kotschy — *Q. armeniaca* in 1862 (l. c. Tab. 25), the diagnosis of *Q. stranjensis* appeared in 1928, Steven's name, therefore, has rights of priority and must replace the others.

**Quercus iberica* MB. (= *Q. lamprophyllos* C. Koch — Schwarz, Monogr. 1, p. 61). — Bithynia: circa Hendek, in declivi meridionali montis Ohlamurluk (vallis Ulu-Dere), una cum *Quercu polycarpa* silvam efficiens, ca. 400 m (24. VI. — No. 63).

How difficult it is to determine some specimens of oaks, especially in the absence of fruits, as in the case of my No. 63, is shown by the fact that, according to Mr. Stefanoff, it represents *Q. sessiliflora* Salisb., while Dr. Turrill thinks that it is best matched by a specimen of Kotschy (Herb. Kew) under "*Q. kassanogluensis* Ky.", the systematic position of which is not clear to me; my original determination of the above mentioned specimen was "*Q. stranjensis* Turrill" (= *Q. Hartwissiana* Stev.), which I afterwards admitted to be wrong, lastly Dr. Schwarz related it to *Q. iberica* (Stev.) MB. If this proves right, the area of the species, as given in his monograph (l. c. p. 62), will extend much farther westwards. In fact I suppose its presence

[1]) How close may be the apparent similarity is illustrated by the fact that C. K. Schneider erroneously identifies the authentic specimen of Steven, present in the Museum, Vienna, with *Q. macranthera* Fisch. et Mey. (Ill. Handb. Laubholzk. I, 194, footnote ** (1906).

[2]) While also in my opinion Fig. 4, p. 53 in "Beitrag zur Kenntnis der Pliozänflora . . ." may represent *Q. Hartwissiana*, the impression in Fig. 1, p. 62 seems to resemble *Q. iberica* MB. The latter leaf is obviously different from those Fig. 2—6 on pages 62—63, which are possibly to be referred to "*Q. pseudodschorochensis* Ky." (? = *Q. polycarpa* Schur — see below).

even in the Stranja, for Fig. 6 in Stefanoff's cited paper (75, p. 75) most probably represents *Q. iberica* BM.

***Quercus colchica*** (Ky.) Czeczott (Plate XXXVII, Fig. 1). — l. c. p. 43.

Frutex ad 1,5 m altus, ramulis glabris, brunneis. Folia flavovirescentia, margine saepe undulata, superne glabra, subtus minute puberula, ad nervum pilis simplicibus parcis instructa, parva, angusta, 3—6 cm longa, 1.5—3,5 cm lata, regulariter lobata, lobi elongati, acutiusculi vel rotundati. Gemmae aestivales rotundatae, parce pilosiusculae. Fructus breve pedunculati, minimi, singuli-terni; cupulae squamis partim convexis, pubescentibus, dorso calvescentibus. Glans cupulam aequans (an semper?).

Bithynia: circa Hendek, in latere vallis Ibrik-Dere, una cum *Q. infectoria* × *polycarpa*, *Erica arborea* et *Arbuto Unedine* dumeta efficiens, ca. 250 m (31. I. — No. 501)[1]). — Paphlagonia: supra oppidulum Küre, in declivi orientali montium, una cum *Q. polycarpa* dumeta efficiens, alt. 1250—1300 m (5. VIII. — No. 627). Circa Edjevid, in pineto collium propinquorum dumeta efficiens, una cum *Q. polycarpa*, ca. 1100 m (non lecta). Circa Zunguldak, in declivi collium calcareorum ad orientem spectante, a mari averso, una cum *Q. polycarpa* dumeta efficiens (11. VIII. — No. 502).

As the fruits in my specimens are very young, the description of them is based on the exsiccate of Kotschy: "Rev. gen. *Quercus*. Crescit in Colchis valle Dschoruk, misit Baum" (Herb. Berlin-Dahlem). Wenzig mentions this species as a form of *Q. dschorochensis* C. Koch (89, p. 188 "Forma *Colchica* Ky. foliis angustioribus") and refers to another specimen of Kotschy, No. 40a, ad Trapezunt, which I have not seen. I am inclined to consider *Q. colchica* No. 5781, Sintenis, Darsosdagh, 1894 (Herb. Freyn. Brno); somewhat doubtfully No. 5060, Sintenis, Küre-Nahas, in silvis ad Edschevit, 1892, may also be placed in this species.

The upright leaves, together with the small dimensions and yellowish colouring of the leaves (observed not only on dried specimens but also on living ones) make it rather easy to recognize this species among other shrub oaks which accompany it. The recorded occurrences, although few, show that *Q. colchica* is probably widely distributed throughout Northern Asia Minor[2]).

[1]) This is a poor specimen which it would perhaps be more correct to refer to *Q. polycarpa* Schur.

[2]) The traveller who crosses Northern Anatolia from south to north, following the well-known road from Ankara to Ineboli, when entering the region of the

**Quercus polycarpa* Schur — Schwarz, Monogr. I, p. 72. — As a tree: Bithynia: circa Hendek, in declivi meridionali montis Ohlamurluk (vallis Ulu-Dere), una cum *Quercu iberica* et fruticibus *Ericae, Arbuti*

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chains bordering the Black Sea, is there struck by the great part played in the vegetation by some mesophytic shrub oaks, developed either as independent communities (Küre, Uzun-Dere) or as a shrub layer in the pine-woods (near Edjevid — see the descriptive part, p. 108—110). Even a superficial inspection in the field allows one to recognize two different forms (see Plate XXXVII): the one constitutes many-stemmed shrubs, about 2 m in height, with medium-sized or small green leaves, having more or less irregular, rounded or acute small lobes and flat open sinus, hanging down on long petioles. The other is represented by much smaller shrubs, with narrow, small, very regularily lobed, yellowish leaves, upright on their rather short petioles. At the time of my visit to that region both were richly fruiting. I did not notice either of them in the tree form: the few oak-trees found there represented *Q. Bornmülleriana* Schwz., *Q. Hartwissiana* Stev. or some species related to *Q. polycarpa* Schur., displaying some features in common with *Q. Dalechampii* Ten. (nos 547, 548).

When I arranged systematically my collection of oaks, the original specimen of *Q. dschorochensis* of Karl Koch in Berlin was inaccessible, so that I was obliged, when determining this group, to use as a basis the description of Koch (34, XXII, p. 328) and the specimens of Kotschy, Sintenis and the one sent me kindly by the late Woronow (No. 623, S. Turkevicz), collected in the region of Dschorokh, and determined by another taxonomist as *Q. dschorochensis*. On the other hand, I had then no idea as to the validity and distribution of *Q. polycarpa* Schur., to which the above-mentioned species seems to be related. Consequently part of my determinations proved to be erroneous.

The specimens with the yellowish leaves I related to the species *Q. colchica* (Ky.) Cz. Dr. Schwarz, on the basis of the specimens of Kotschy, lowered its rank, considering it a narrow-leaved form of *Q. dschorochensis* C. Koch (Monograph. I. p. 66, Pl. V, figs 13—16). In view of the scarcity of the available materials of the latter species it must be left for future research to resolve what are the taxonomic relations between my *Q. colchica* and *Q. polycarpa* on the one hand, and between the former and *Q. dschorochensis* on the other. If my specimens are to be related to the latter species, they deserve a higher rank than that of form, on account of their occurring in a great number of individuals characterised by some common features in a definite geographical area.

The specimens taken from the large shrubs with the green, hanging leaves I related partly to *Q. dschorochensis* (nos 550, 552, 633, 499) and partly to *Q. pseudo-dschorochensis* Ky. (nos 461 and 461 bis), according to the character of the lobes. As the typical specimens of the latter I consider No. 39 of Kotschy (Revisio gen. *Quercus*, in valle pr. Gümüsh Chane inter Trapezunt et Erzerum, Schnell, 1859), his another sheet, bearing no number (pr. Trapezunt versus Tschoruk, Baum, 1856), and No. 2062, Krause, 1926 ("bei Kavak . . . 500—600 m" det. by Dr. Schwarz as *Q. dschorochensis* C. Koch) — all in Herb. Berlin-Dahlem. In my notes on the subject, the publication of which I postpone in view of much better grounded notes on this difficult group found in the monograph of Dr. Schwarz, I then expressed

et *Genistae* raram silvam efficiens. ca. 650 m (3. II. — No. 764); ibidem, alia forma abunde fructicans, pedunculis ca. 1 cm longis, ca. 400 m (24. VI. — No. 72); ibidem, in declivi montis Yilman, una cum *Tilia argentea* silvam efficiens, ca. 450 m (25. VI. — No. 549). As a shrub: Paphlagonia[1]: supra oppidulum Küre, in declivi orientali montium, una cum *Quercu colchica* dumeta efficiens, alt. 1250—1300 m (5.VIII. no. 550 — forma foliis lobis rotundatis, rarior); ibidem, frutices ca. 3 m alti, frequens (5. VIII. — No. 461 et 461 bis). Circa Edjevid, in pinetis collium, una cum *Quercu colchica* densa fruticeta efficiens, ca. 1100 m (non lectum). Inter Küre et Ineboli, in declivi meridionali montium, in pseudomacchia, una cum *Erica arborea*, *Arbuto Unedine*, aliis, ca. 900 m (7. VIII. — No. 499). Circa Zunguldak, in declivi collium calcareorum ad orientem spectante, a mari averso, una cum *Quercu colchica* dumeta efficiens (11. VIII. — No. 552, 552 bis, 633 — forma foliis lobis rotundatis).

No. 72 represents some distinct form, remarkable by its non-sessile abundant fruits, which are disposed in clusters, 3—7 fruits on each peduncle, 0,5—1,5 cm in length. The leaves are yellowish, hard, with inconspicuous minute nervation, few lobed and having a cuneate basis. Quite identical with it is No. 1207, Bornmüller, "*Q. sessiliflora* Sm. var. *aurea* Wierzb." Amasia: in mte Ak-Dagh. 25. VII. 1889. (In my opinion it has nothing to do with *Q. aurea* Wierzb.)

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the view of the possible identity of *Q. dschorochensis* and *Q. pseudodschorochensis*. I was struck by the resemblance of my *Q. pseudodschorochensis* No. 461, on the one hand, to the fossil oak *Q. roburoides* Bér., described from the Pliocene of Southern Europe (namely to figs 2—6, pp. 62, 63, in the paper by Stoyanoff and Stefanoff, 79), on the other — to some European specimens collected by E. Preissmann in Styria near Graz"... bei Graz in Steiermark, 400 m" (two sheets in Natural History Museum, Vienna). In the opinion of Dr. Schwarz this part of my specimens represents *Q. polycarpa* Schur. After visiting, in 1936, the vast forests constituted by this species in the Stranja mts., I know it pretty well and can agree with this determination of it only as far as it concerns the Bithynian (Cham-Dagh) specimens. As to the Paphlagonian ones, it was with great hesitation that I signed the name "*Quercus polycarpa*" under Photo 2 in Plate XXXVII and put their occurrences in the list under this species. For, while *Quercus polycarpa* is a tree, in the case of the Paphlagonian specimens we are dealing with some shrub-oak. It would, perhaps, be more correct to relate them to *Quercus pseudodschorochensis* Ky. (I am, however, unable to grasp what position is assigned to the last-mentioned species by the monographer of oaks.)

[1]) On the Paphlagonian specimens see the remarks in footnote 2) to page 230.

*Quercus Dalechampii* Ten.? (= *Q. aurea* Wierzb. — Schwarz, Monogr. I, p. 82). — Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in declivi montis Khadji-Aghach, in margine pineti, arbor ingens solitaria, in circuitu 6 m, ca. 1200 m (1. VIII. — No. 548*). Inter Küre et Ineboli, in regione montana inter silvas destructas (*Quercus, Fagus, Abies*), arbor magna, ca. 9100 m (7.VIII. — No. 547)[1]).

**Quercus longifolia* C. Koch (= *C. Kochiana* Schwz. — Monogr. I, p. 90). — Galatia: circa Arab, in latere septentrionali vallis Yaila-Chai (mons Eldiven-Dagh), in pineto, ca. 1350 m (18. VII. — No. 514).

*Quercus crispata* Stev. (= *Q. pubescens* W. ssp. *anatolica* Schwz. 67, p. 336). — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tasköprü), in latere orientali vallis Chamkeui-Su, una cum *Quercu Cerri* et *Q. infectoria* fruticeta efficiens, ca. 850 m (30.VII. — No. 515, 516[2]), 518b, 519a, b, c).

In the Natural History Museum, Paris, I have seen the specimens collected by Wiedemann, of which that from Keshish-Dagh, near Tokat, undoubtedly represents this species, while the one bearing the label "inter Aradsch et Kastamuni, Hamamly et Safranboli, 1835" is most probably also *Q. crispata* Stev. In this way the Crimean oak seems to be limited in its distribution in Asia Minor to that part of it which opposes the Crimea[3]).

**Quercus Bornmülleriana* Schwz. — Monogr. I, p. 125. — Paphlagonia: circa Edjevid, in limite agrorum, ca. 1150 m (6. VIII. — No. 512). Inter Küre et Edjevid, in silva mixta montis Kush-Tepe, rara, ca. 1350 m (5. VIII. — No. 511).

The occurrences of this interesting species in the mountains near Amasia, where it has been found by Bornmüller, have been considered hitherto the only ones. Our discovery of *Q. Bornmülleriana* in Paphlagonia considerably increases its range, the more so as in this species should be placed, in my opinion, the specimen of Sintenis

[1]) Of the two specimens only No. 548 has been revised by Dr. Schwarz. He determined it as: "*Quercus polycarpa* Schur. vergens ad *Q. Dalechampii* Ten. (= *Q. aurea* Wierzb.)."

[2]) When revising some of the above specimens Dr. Schwarz noticed that No. 516 was "ad *Q. longifoliam* K. Koch accedens" — the same may be said about No. 515.

[3]) For an explanation see p. 62 in Czeczott, 18.

No. 5301 b, under "*Q. mannifera* Lindl." collected in 1892 in Paphlagonia: Tossia, Giaurdagh (Herb. Freyn, Brno)[1]).

**Quercus Pseudotozza* Ky. (= *Q. Kotschyana* Schwz. — Monogr. I, p. 144; = *Q. tukhtensis* Czeczott — l. c., p. 44). — Paphlagonia: supra oppidulum Tukht, in declivi orientali montis Bokly-Tepe, fruticeta efficiens, ca. 1600 m, fol. (13. VII. — No. 236).

"This shrub-oak resembles in the character of its indumentum some forms of *Q. pubescens* Willd., but is certainly a different species (persistent stipules, very regular numerous lateral nervation etc.). In the shape of its elongated lobes, narrow deep incisions, and persistent stipules it agrees with some specimens of *Q. macranthera* F. et M., and still better with No. 25 Kotschy (Herb. Berlin-Dahlem), No. 5303 and No. 3056 of Sintenis, and No. 1224, Bornmüller (all in Herb. Freyn, Brno), which bear different denominations, but surely all represent *Q. syspirensis* C. Koch. Since no fruits are present on my specimens, I cannot relate them to either species and risk the above description hoping that in future "*Q. tukhtensis*" will be proved a subspecies of *Q. macranthera* — as a parallel form to and of equal taxonomic value with *Q. syspirensis*, or perhaps an incanous variety of the latter species"[2]).

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[1]) According to Dr. Schwarz my No. 511 is not typical and displays some features in common with *Q. pubescens* ssp. *anatolica* (= *Q. crispata* Stev.). It has narrow, rather long lobes, and consequently a narrow, deep sinus; here and there intercalary nerves are visible. Both my specimens have been collected in two not distant from each other localities, both characterized by a rather mesophytic type of vegetation (*Fagus, Abies, Taxus, Daphne pontica* and some other "Colchic" species), where *Q. crispata*, a xeromorphic species, would be out of place. It is not to be denied, however, that No. 511, as well as No. 5301 b, Sintenis, show a certain resemblance to another species of oak — *Q. Pseudotozza* Ky., collected by me to the south of the Ilgaz-Dagh range.

In my recent publication on the problem of Pontis (18, pp. 52, 59, 62) I have mentioned several times *Q. macranthera* F. et M. (to which species I primarily related my specimens) to illustrate some distributional regularity in Asia Minor. As *Q. Bornmülleriana* is so closely related to this Transcaucasian-Persian oak that it may be looked upon as its western derivate, our speculations remain unaltered, although by mistake another denomination has been used.

[2]) Thus I wrote in 1928, when tentatively describing these specimens as a new species, ssp. or variety, under the name of *Q. tukhtensis* (16, p. 44). Quite recently Dr. Schwarz has placed them in *Q. Pseudotozza* Ky., a species known, up to now, only from the Lebanon mts. In this way we have to add to a series of species displaying the discontinuity of the range in the north-south direction, as *Fagus rientalis, Aobies Nordmanniana, Picea orientalis, Trychystemon orientale, Rhodo-*

*Quercus Frainetto* Ten. (= *Q. conferta* Kit. — Schwarz, Monogr. I, p. 132). — Bithynia: circa Hendek, in latere vallis Ibrik-Dere, arbores magnae solitariae inter fruticeta *Quercus infectoriae* × *polycarpae, Ericae, Arbuti*, ca. 250 m (31. I. — No. 706); ibidem, in declivi montis Salman-Tepe, arbores solitariae in pseudomacchia una cum *Quercu infectoria* × *polycarpa, Erica, Arbuto* (6. II. — No. 725); ibidem, in monte Kurt-Dagh, arbores solitariae inter fruticeta (pseudomacchia), in declivi meridionali, ca. 300 m (11. II. — No. 743).

**Quercus infectoria* Oliv. ssp. *glabra* Schwz. — Circa Byzantium: supra pagum Sari-Yar, in macchia, alt. 60—180 m (25. I. — No. 815); ibidem, in macchia una cum *Cisto salviifolio, C. villoso, Erica arborea, Arbuto Unedine*, frequens (12. VI. — No. 11); supra pagum Rumeli-Kavak, in macchia una cum *Quercu coccifera*, copiosissime (16. VIII. — No. 497 et 498).

All the specimens collected near Constantinople agree well with the type of Oliver present in the Natural History Museum in Paris; as to those from Anatolia, they differ from the type by the presence of stellate hairs on the upper surface of the leaves and the tomentum on their lower surface.

**Quercus infectoria* Oliv. ssp. *puberula* Schwz. — Galatia: circa Arab, in monte Eldiven-Dagh, in parte inferiore vallis Yaila-Chai, una cum aliis *Quercibus* fruticeta efficiens, ca. 1200 m (19. VII. — No. 518a). — Paphlagonia: circa vicum Djazoglu (inter Sinopen et Tashköprü), in latere orientali vallis Chamkeui-Su, una cum *Quercu Cerri* et *Quercu crispata* fruticeta efficiens, ca. 850 m (31. VII. — No. 517); ibidem, in declivi meridionali montis Khadji-Aghach, in pineto, ca. 1200 m, arbuscula, rarior (1. VIII. — No. 513, forma ?).

No. 513 resembles most closely *Q. Boissieri* Reut. — in Boiss. Diagn. plant. orient. nov. vol. II, fasc. 12, 1853, p. 119 — from which it differs by the presence of indumentum and smaller leaves.

*Quercus coccifera* L. — Ins. Prinkipo: in pineto (*Pinus Brutia*), una cum *Junipero Oxycedro, Erica arborea* et *Cisto*, frequentior (26. II.

*dendron ponticum*, one more example — that of *Q. Pseudotozza* Ky. (see maps in figs. 4, 7, 8, 10, and 11 in my paper 18).

On the environmental conditions of the remarkable locality in which *Q. Pseudotozza* grows in Paphlagonia one may judge from Pl. X, Phot. 20, Pl. XI, Phot. 21. As shrubs 1—$1^1/_2$ m in height, they losely cover (intermixed with *Berberis crataegina, Cotoneaster nummularia*, and with some other shrub-oak, unfortunately not collected), the slope of the side ravine transverse to that visible on Plate XI, Phot. 21.

— No. 95). — Circa Byzantium: supra pagum Rumeli-Kavak, in macchia, rarior (16. VIII. — No. 496).

*Quercus Cerris* L. var. *typica* Loud. (Pl. XXXVIII, Fig. d). — C. K. Schneider, Ill. Handb. Laubholzk. I, 1906. p. 181. — Paphlagonia: circa vicum Djazoglu (inter Sinopen et Tashköprü), in latere austro-orientali vallis Chamkeui-Su fruticeta efficiens, ca. 850 m (31. VII. — No. 509).

*Quercus Cerris* L. f. *haliphloes* (Lam.) Schneider (Pl. XXXVIII, Fig. b) — l. c. — Paphlagonia: in parte superiore vallis Kuru-Chai (inter Sinopen et Tashköprü), arbores magnae in alveo rivuli. ca. 700 m (30. VII. — No. 384); ibidem, prope vicum Djazoglu, in latere austro-orientali vallis Chamkeui-Su, alta fruticeta una cum *Quercu crispata* et *Q. infectoria* efficiens, ca. 850 m (31. VII. — No. 507 et 506?); ibidem, in declivi meridionali montis Khadji-Aghach, in pineto, ca. 1250 m (1. VIII. — No. 510?).

*Quercus Cerris* L. f. (nov.) ***incisissima*** Czeczott (Pl. XXXVIII. Fig. c). — Foliis profundissime sinuato-lobatis. — Paphlagonia: circa vicum Djazoglu (inter Sinopen et Tashköprü), in latere austro-orientali vallis Chamkeui-Su, ca. 850 m (31. VII — No. 505).

*Quercus Cerris* L. f. (nov.) ***subconferta*** Czeczott (Pl. XXXVIII. Fig. a). — Foliis *Quercui confertae* proximis. — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), frutices et arbores in declivi versus vallem Chamkeui-Su, alt. 700—800 m. copiosissime (30. VII. — No. 386); ibidem, in latere austro-orientali vallis Chamkeui-Su, una cum *Quercu crispata* et *Q. infectoria* fruticeta efficiens, ca. 850 m (31. VII. — No. 508)[1]).

**Quercus infectoria × polycarpa*. — Bithynia: circa Hendek, in declivi meridionali montis Cham-Dagh, prope vallem Ibrik-Dere, una cum *Quercu conferta* (31. I. — No. 708?); ibidem, inter vicum Shekhlar et vallem Isak-Oglu-Dere, humiles silvulas efficiens. ca. 200 m (27. VI. — No. 503). — Paphlagonia: inter Küre et Ineboli, in declivi meridionali montium, in pseudomacchia, una cum *Erica arborea*, *Arbuto Unedine*, *Quercu polycarpa* frutescenti, aliis, ca. 900 m (7. VIII. — No. 500)[2]).

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[1]) According to the determinations of Dr. Schwarz my specimens No. 506, 507, 509, 510, 384 are *Q. Cerris* L. ssp. *Tournefortii* (W.) Schwz.; No. 505 — *Q. Cerris* ssp. *Tournefortii* f. *Pseudocerris* (Boiss.) Schwz.; lastly, No. 386 and (probably) 508 — *Q. Cerris* ssp. *Tournefortii* f. *cilicica* (Ky.) Schwz. It is remarkable that all these forms occur in one locality.

[2]) I have placed these specimens in *Q. dschorochensis* C. Koch. If Dr. Schwarz' determination is correct, this hybrid is widely distributed in Northern Asia Minor.

*Castanea sativa* Mill. (= *C. vesca* Gaertn.) — G. Hegi, Ill. Fl. v. Mitt.-Eur. Bd. III, p. 101. — Circa Byzantium: supra pagum Sari-Yar, in horto (12. VI. — No. 35). — Bithynia: circa Hendek, in valle Ulu-Dere, ad radices montis Ohlamurluk, ad rivulum, ca. 380 m (25. VI. — No. 90); ibidem, in valle Su-Atak-Dere, arbusculae in carpineto-fageto ad rivulum, ca. 460 m (non lectum. Plate VII. Phot. 13).

*Fagus orientalis* Lipsky (= *F. asiatica* H. Winkler) — Acta Hort. Petrop. XIV, Fasc. 2. 1888, p. 300, cp. Wulff, 94, p. 110. — Bithynia: Polonez-Key (Adampol), (lg. Musa Sabri VII. 1931 — No. 677); circa Hendek, in montibus Kurt-Dagh et Yildiz-Dagh fageta in declivibus ad septentrionem spectantibus vel silvas mixtas (una cum *Quercu polycarpa* et *Carpino*) in aliis declivibus efficiens: II — No. 720); ibidem, in valle Ulu-Dere, in declivi austro-occidentali montis Ohlamurluk, silvas cum *Quercu, Tilia argentea, Carpino* efficiens, ca. 520 m (24. VI. — No. 66). — Paphlagonia: Kandylly supra (inter Eregli et Zunguldak), ca. 280 m et 290 m; (leg. Musa Sabri VII, 1931, — No. 678, 679, 680). Inter Küre et Edjevid, in monte Kush-Tepe, una cum *Abiete, Taxo, Acere, Carpino* silvam mixtam efficiens, ca. 1460 m (5. VIII. — No. 579). Inter Küre et Ineboli, in regione silvarum destructarum (*Fagus, Quercus*), ca. 1000 m (7. VIII. — No. 585)[1]).

## *Betulaceae.*

*Corylus Avellana* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia *Castanea* admixta, in horto. (26. I. — No. 744). — Bithynia: circa Hendek, in declivi montium (vallis Takhtalyk-Dere), in parte inferiore regionis silvaticae, ca. 200 m (1. II. — No. 757). — Paphlagonia: in superiore cursu rivuli Kuru-Chai (inter Sinopen et Tashköprü), una cum *Quercu Cerri* et *Ostrya carpinifolia* (3. VIII. — No. 619). Inter Küre et Edjevid, in declivi boreali montis Kush-Tepe, in silva mixta, ca. 1350 m, abunde (5. VIII. — No. 667).

*Carpinus Betulus* L. — Bithynia: circa Hendek, in declivi meridionali montis Ohlamurluk (vallis Ulu-Dere), in raro querceto, alt. 400—500 m (24. VI. — No. 81); ibidem, in valle Su-Atak-Dere (26. VI. — No. 831). — Paphlagonia: in declivi septentrionali jugi Ilgaz-Dagh, in siccis alveis in regione pinetorum et abietetorum, ca. 1600 m (24. VII. — No. 359). Inter Küre et Edjevid, in declivi boreali montis Kush-Tepe, in silva mixta in saxis calcareis, ca. 1400 m (5. VIII. —

[1]) The distribution of *Fagus orientalis* Lipsky is discussed in the present author's paper 17.

No. 675). In montosis supra oppidulum Küre, in angustiis non profundis, ca. 1250 m (5. VIII. — No. 686).

*Ostrya italica* Scop. subsp. *carpinifolia* (Scop.) H. Winkl. (= *O. carpinifolia* Scop.). — H. Winkler, Betulaceae in Engler, Das Pflanzenreich. IV. 61. 1904. p. 22. — Paphlagonia: in parte media vallis Kuru-Chai (inter Sinopen et Tashköprü), una cum *Corylo Avellana*, gregatim. (3. VIII. — No. 634). Inter Küre et Ineboli. in valle Alma-Dere. in margine silvae mixtae, ca. 700 m (7. VIII. — No. 482 et 482 bis).

*Alnus glutinosa* Gaertn. — Bithynia: circa Hendek. in valle rivuli Su-Atak-Dere, arbores mediocres, frequentior. (26. VI. — No. 119). — Paphlagonia: juxta viam a Küre ad Ineboli ducentem, prope rivulum Uzünös-Dere, ca. 700 m (7. VIII. — No. 691 et 691 bis).

### *Salicaceae.*

*Salix alba* L. — Bithynia: circa Hendek, in alveo rivuli Su-Atak-Dere, rarior. (26. VI. — No. 108). — Paphlagonia: inter Changri et Tukht, arbor magna ad fossam irrigatoriam, ca. 900 m (11. VII. — No. 197).

*Salix babylonica* L. — Bithynia: inter Hendek et Ada-Bazar, in valle fluvii Mudurlu, arbor magna ante hospitium (23. VI. — No. 58).

*Salix purpurea* L. forma ?[1]). — Galatia: circa oppidulum Arab, in cursu superiore rivuli Yaila-Chai (mons Eldiven-Dagh), inter dumeta, ca. 1450 m (18. VII. — No. 304).

*Salix caprea* L. f. *orbiculata* Kerner? — Bithynia: circa Hendek, in declivi austro-occidentali montis Yilman (vallis Ulu-Dere), in querceto inter novellas *Tiliae argenteae* et *Fagi*, ca. 450 m (25. VI. — No. 91); ibidem, in latere meridionali vallis Su-Atak-Dere, in querceto *Fago* admixta (26. VI. — No. 99).

*Salix incana* Schrank. — Bithynia: in valle Bichki-Dere (jugum Kurmaly-Dagh), ad rivulum. ca. 300 m (30. VI. — No. 134).

*Salix incana* Schrank β *angustissima* Wimmer — exsic. Herb. Boiss. — Paphlagonia: in declivi boreali jugi Ilgaz-Dagh. in alveo torrentis Balyk-Deressi, ca. 1225 m. copiosissime (28. VII. — No. 374).

[1]) Determined Mr. A. R. Horwood (Kew).

*Populus tremula* L. — Bithynia: circa Hendek, in declivi meridionali montis Ohlamurluk (vallis Ulu-Dere), in querceto, ca. 400 m, rarior (24. VI. — No. 77). — Galatia: circa oppidulum Arab, in parte superiore vallis Yaila-Chai, in fruticetis ad rivulum, ca. 1600 m (19. VII. — No. 871). — Paphlagonia: in declivi orientali montium supra oppidulum Küre, in angustiis, ca. 1250 m abunde (5. VIII. — No. 685).

## Monocotyledones.

### *Araceae*[1]).

*Arum Nickelii* Schott. — J. Hruby, Le genre *Arum*. Bull. Soc. Bot. Genève, 1912, p. 134. — Circa Byzantium: supra pagum Sari-Yar, in lateribus angustiarum in macchia, frequens. fol. juven (2. III. — No. 420). — Bithynia: circa Hendek, in valle Ulu-Dere, inter fruticeta *Pruni Laurocerasi* et *Coryli Avellanae* ad rivulum, ca. 370 m, fol. juven. (10. II. — No. 769); ibidem, inter frutices ad marginem viarum frequens (non lectum). Inter Hendek et Ada-Bazar, in planitie Ak-Ova inter fruticeta ad rivulum, fr. (29. VI. — No. 136).

### *Sparganiaceae.*

*Sparganium ramosum* Huds. — Bithynia: inter Hendek et Ada-Bazar, in paludibus circa fl. Mudurlu una cum *Typha, Carex* etc. (23. VI. — No. 832).

### *Typhaceae.*

*Typha latfolia* L. — Paphlagonia: circa Edjevid, in prato in fossa irrigatoria, gregatim, ca. 1100 m (6. VIII. — No. 469).

### *Orchidaceae.*

*Serapias pseudocordigera* Mor. — Circa Byzantium: prope pagum Sari-Yar, loco unico — sub *Castanea* ubi macchia plane evanescit. (12. VI. — No. 26).

*Orchis incarnata* L.? — Galatia: circa oppidulum Arab, in valle Yaila-Chai versus occidentem aperta, ad rivulum, ca. 1400 m (18. VII. — No. 302).

A unique poor specimen under this number does not permit a certain determination.

*Orchis maculata* L. — Paphlagonia: inter oppidum Changri et pagum Inekeui (ad fl. Devrez-Chai), in pratulo paludoso, ca. 1300 m (21. VII. — No. 924 et 924 bis).

*Cephalanthera rubra* (L.) Rich. — Bithynia: circa Hendek, in declivitate montis Ohlamurluk (vallis Ulu-Dere), in fageto, alt. 400 ad

[1]) Determined Dr. J. Hruby (Brno).

600 m (24. VI. — No. 899); ibidem, in declivitate montis Yilman, in fageto rhododendroso. ca. 450 m, rara. (25. VI. — No. 87). — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai (mons Eldiven-Dagh) in pineto, ca. 1350 m (18. VII. — No. 297).

*Epipactis latifolia* All. (= *E. Helleborine* γ. *viridans* Crantz) — E. G. Camus. Monographie des Orchidées, 1908, p. 412 — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai (mons Eldiven-Dagh), in pineto. ca. 1350 m, rarior. (18. VII — No. 298).

*Limodorum abortivum* Swartz. — Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in declivitate montis Khadji-Aghach, in pineto, ca. 1500 m, rarum (1. VIII — No. 406).

## *Iridaceae.*

*Romulea graeca* Bég. var. *Sintenisii* Bég. (= *R. Linaresii* Parl. subsp. *graeca* Bég. var. *Sintenisii* Bég.) — A. Béguinot, Diagnoses *Romulearum* novarum vel minus cognitarum" in Engl. Bot. Jahrb. 1907, p. 325. — Ins. Prinkipo: in margine macchiae juxta semitam, solitaria, fl. (26. II. — No. 789).

***Iris longepedicellata*** Czeczott (Pl. XXXIX) — l. c. p. 44.

Sectio: *Apogon* — "The *spuria* group" — W. R. Dykes, The Genus *Iris*, Cambridge, 1913, p. 18.

Rhizoma horizontaliter repens. Caules ca. 35 cm alti, binos flores terminales (nonnunquam praeterea unum lateralem) ferentes. Spathae (in sicco) pallido-stramineae, valvis 11—13 cm longis. 5—10 mm latis, anguste lanceolatis. acuminatis, longitudine tubulum vix superantes, ovarium non obtegentes. Folia longitudine caulem subaequantia, ensiformia, glauca, 30—40 cm longa, 10—12 mm lata. Pedicellus 4,5—6,5 cm longus. Ovarium 1.5—2,5 cm longum, sensim in collum transiens. 2—2,5 cm longum et abrupte in tubum (5—7 mm latum, 7 mm longum) campanulato-infundibuliformem transiens. Limbus pallide lutescens. laciniis ad lineam medialem luteo-venosis. Lacinia exteriora unguibus 3.5 cm longis. ca. 5 mm latis, abrupte in lamina ovalia, reflexa dilatatis, 3 cm longa, 2 cm lata, apice emarginata. Lacinia interiora rotundato-cuneata. late emarginata. 5,5 cm longa, 1,3 cm lata. Stigmata lobis subfalcatis. acutis, 10—12 mm longis, marginibus integris. Antherae filamentis longiores. Capsula (juvenilis) trigona. ad angulos bicarinata.

Galatia: inter pagum Yanarkeui (Seraikeui) et oppidulum Arab, in monte Eldiven-Dagh, in paludibus ad fontes, ca. 1300 m, gregatim. (16. VII. — No. 282).

It is related to *Iris ochroleuca* L. and *Iris Güldenstädtiana* Lepech.[1]) and comes decidedly nearer to the former, having besides other features in common the blade of the falls reflexed at a right angle (as far as can be seen on dried specimens). It is distinguished from *I. ochroleuca* by 1) twice as narrow leaves, 2) ovaries only covered with spath valves for half their length or even less, which is caused by 3) longer pedicells and necks and 4) narrower spathe valves. — The features which distinguish *I. Güldenstädtiana* are more numerous: it differs by often falcate leaves, smaller flowers, much narrower blade of falls, which are spreading, by differently shaped tubes (narrower in proportion to their height), by more or less covered ovaries, much shorter pedicells and so on.

The locality it which it grows is situated between the areas of the two species mentioned.

*Iris Kerneriana* Aschers. et Sint. (= *I. Haussknechtii* Bornm. — J. Bornmüller, 10, I, p. 43) — W. R. Dykes, l. c. p. 70. — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai, in pineto in humida lacuna una cum *Phragmite communi* ca. 1350 m, fr. (18. VII. — No. 276). — Paphlagonia: supra oppidulum Tukht, in loco Chirchir-Bunar dicto in declivitate saxosa collium stepposorum sub *Quercu* frutescenti, ca. 1500 m, fl. (13. VII. — No. 243).

It has been found growing in Galatia also by Sir R. Lindsay. ("Flora of Angora No. 66. Chankaya", Herb. Kew — see 33, p. 13.)

## *Amaryllidaceae.*

*Galanthus nivalis* L. — Bithynia: circa Hendek, in valle Ulu-Dere ad meridiem aperta, sub frutice *Pruni spinosae*, frequens, ca. 300 m, fl. (3. II. — No. 751).

## *Liliaceae.*

*Lilium Martagon* L. — Paphlagonia: inter Küre et Edjevid. in declivitate boreali montis Kush-Tepe in silva mixta (*Fagus*, *Abies*, *Taxus*, *Carpinus* etc.), ca. 1350 m, rarior. (5. VIII. — No. 448).

[1]) Dykes (l. c.) considers both as subspecies of *I. spuria* and gives as synonym of the latter one: *I. spuria* L. var. *halophila* Dykes. To be in accordance with this I have put my new iris as a subspecies to the group *I. spuria*. Taking in consideration, however, that there is a well pronounced difference between *I. ochroleuca* and *I. Güldenstädtiana* and that my form stays much nearer to the former, it would be probably more right to conserve specific rank for the two and apply my form as subspecies to *I. ochroleuca* L.

*Gagea amblyopetala* Boiss. et Heldr. — Ins. Prinkipo: ad cacumen insulae, in fissuris nudorum saxorum quarciticorum, una cum *Ranunculo calthaefolio* et *Erodio cicutario*, copiose, fl. (26. II. — No. 486).

*Ornithogalum pyrenaicum* L. — Circa Byzantium: supra pagum Sari-Yar in collibus calcareis ad viam, ca. 150 m. fl. (12. VI. — No. 8). — Galatia: inter pagum Yanarkeui (Seraikeui) et oppidulum Arab in monte Eldiven-Dagh juxta viam, inter *Quercus* frutescentes, ca. 1400 m. fl. (16. VII. — No. 286).

*Ornithogalum montanum* Cyr.? — Ins. Prinkipo: in cacumine aperto in fissuris humidis inter scopulos quarciticos, una cum *Erodio cicutario, Gagea amblyopetala* et *Ranunculo calthaefolio*, copiose, fol. (16. II. — No. 814).

*Ornithogalum nanum* Sibth. et Sm. — Circa Byzantium: in collibus calcareis supra pagum Sari-Yar, ca. 150 m, passim gregatim, fl. (2. III. — No. 817).

*Allium rotundum* L. — Galatia: inter Angora et Kaledjik, in transitu montium inter fluvios Sakaria et Kizyl-Irmak, in collibus stepposis, ca. 1300 m (10. VII. — No. 181). — Paphlagonia: supra oppidulum Tukht, in monte Bokly-Tepe, inter frutices *Juniperi nanae*, ca. 1750 m (13. VII. — No. 887). In declivitate montis Kush-Kayasy (jugum Ilgaz-Dagh), in margine agri *Tritico* consiti, ca. 1830 m (26. VII — No. 369).

*Allium phrygium* Boiss. — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai, in fruticibus ripariis pineto circumdatis, ca. 1460 m (18. VII. — No. 861).

*Allium pulchellum* Don. — Galatia: inter Angora et Kaledjik, in transitu montium inter fluvios Sakaria et Kizyl-Irmak, in collibus stepposis, ca. 1300 m (10. VII. — No. 180). — Paphlagonia: circa pagum Yailadjik (vallis Ilgaz-Su), in stepposis, ca. 1130 m (25. VII. — No. 864).

*Allium* sp. — Paphlagonia: supra oppidum Ineboli, in declivi mare versus vergente, in limite agrorum infra *Rubos* (9. VIII. — No. 637).

Not matched, for the flowers of the unique, very poor specimen, are in a too young condition.

*Muscari latifolium* Kirk? — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai, in pineto, ca. 1350 m, frequentior, fr. (17. VII. — No. 337).

*Muscari racemosum* L. — Byzantium: ad moenia veteris castelli Yedi-Kule in Stambul, abunde, fl. (22. II. — No. 816).

*Muscari neglectum* Guss.? — Paphlagonia: supra oppidum Ineboli, in declivi mare versus vergente, in limite agrorum infra *Rubos*, fr. (9. VIII. — No. 631).

The determination of specimens of *Muscari* under No. 337 and 631 is not certain, for at the time they have been collected, July and August, no traces of leaves, not to speak of flowers, remain.

*Asphodeline taurica* Pall. — Paphlagonia: in prato alpino depasto infra cacumen montis Büyük-Ilgaz-Dagh, ca. 2400 m, certis locis gregatim, fr. juven. (24. VII. — No. 335).

***Asphodeline Wiedemanniana*** Czeczott (Pl. XXXI, Fig. 1) — l. c. p. 44.

Rhizoma breve, saepe subobliquum, fibras tenues cylindricas edens; folia omnia subbasilaria, rosulata, numerosa, 20—35 cm longa, (1)—ad 6 mm lata, stricta, triquetra, rigidula, margine scabrida, apice subulato-attenuata, basi in vaginam membranaceam, 5(—7)-nerviam sensim dilatata; caulis teres, elatus, nudus, in racemum longiusculum (20—40 cm longum, 3—4 cm in parte media latum), laxiusculum, basi ramosum, rarius simplicem abiens; bracteae scariosae a basi triangulari apicem versus longe subulato-acuminatae, paniculis floralibus longiores, capsularibus aequilongae vel breviores; pedunculi fasciculati, ad medium vel infra aut supra articulati, florales 12—15 mm, capsulares 18—22 mm longi; perigonium album, sub anthesi 18—23 cm longum, laciniis anguste linearibus, obtusiusculis, nervo valido obscure sanguineo percursis, quarum exteriores elongatae et latiores, interiores lineari-spathulatae; filamenta glabra, tria exteriora perigonio paulo breviora, stylo aequilonga, tria interiora perigonio dimidio breviora, antherae lanceolatae, valde inaequales, filamentis longioribus triplo maiores; capsulae amphoriformes (10) 11 mm longae, (7) 8 mm latae, ad medium suffultae, basi truncatae, apice vix umbilicatae, valvulis vix rugulosis, non retusis, ± prominenter carinatis, carina apicem versus incrassata; semina 3,5 mm alta, 4 mm lata, acute trigona, dorso ± prominenter bisulcato, undique pustulosa.

Paphlagonia: ad radices meridionales jugi Ilgaz-Dagh, circa pagum Yailadjik, in graminosis aridis et glareosis vallis Ilgaz-Su copiosissime, ca. 1000—1100 m, fructifera (23. VII. — No. 423 — typus).

I place in this species also: "Anatolia", Wiedemann, 1836 (Herb. Berlin-Dahlem) and "Tossia, in montosis", Sintenis, It. Or. 1892, No. 4446, 8. VI. — in flower, No. 4446b, 28. VII. — in fruit

(both under *A. rigidifolia* Boiss.). No. 4446 may be considered as cotypus, for the description of flowers in the above diagnosis has been made from it.

My supposition that the specimens collected by Wiedemann in "Anatolia boreali ad Safranbol et Mersiwan" (Boiss. Fl. Or. V, p. 319 under *A. rigidifolia* Boiss.) are to be related to our new species has been kindly confirmed by Mr. J. N. Woronow, who communicated to me that my description matched quite well the specimens of Wiedemann (and Sintenis) preserved in the Herbarium of the Principal Botanic Garden in Leningrad.

The described new species differs from the related *A. isthmocarpa* J. Gay 1) by its smaller, looser panicles, 2) by the leaves being in the lower part gradually (not abruptly) widened, having the vagina 5—7- (instead of 3-) veined, 3) by the long bracts abruptly subulate (not oblongo-lanceolate), 4) by the form of capsules.

*Veratrum album* L.? — Paphlagonia: in declivitate meridionali montis Büyük-Ilgaz-Dagh, in pineto regionis subalpinae, ca. 1900 m, fol. (24. VII. — Non lectum).

*Polygonatum* sp. — Bithynia: circa Hendek, in valle Su-Atak-Dere, in fageto ad rivulum, ca. 400 m, radices (26. VI. — No. 104).

*Polygonatum polyanthemum* M. B. — Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in silva mixta, ca. 1350 m, fol. (5. VIII. — No. 669).

*Asparagus aphyllus* L. — Circa Byzantium: supra pagum Sari-Yar in margine horti, inter frutices *Lauri, Corni* etc. (2. III. — No. 644); ibidem, in macchia (12. VI. — No. 45).

*Asparagus verticillatus* L. — Paphlagonia: in pago Kuru-Chai, (inter Sinopen et Tashköprü) in horto et in dumetis ad fossam irrigatoriam abunde, ca. 700 m (30. VII. — No. 389).

*Ruscus aculeatus* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia, frequentior, fr. (26. I. — No. 818).

*Ruscus Hypoglossum* L. — Circa Byzantium: supra pagum Sari-Yar, in declivi collium Bosporum versus in macchia, rarum, fr. (25. I. — No. 787). — Bithynia: circa Hendek, in latere vallis Ibrik-Dere, in silva mixta (*Fagus, Carpinus*), ca. 450 m, fr. (31. I. — No. 703; 1. II. — No. 703 bis); ibidem, in valle Hussein-Sheikh-Dere (Yildiz-Dagh), in silva mixta (*Fagus, Carpinus*), ca. 450 m, fr. (4. II. — No. 730).

*Smilax excelsa* L. — Circa Byzantium: supra pagum Rumeli-Kavak, in macchia, fr. (26. I. — No. 642); ibidem, in rubetis prope pagum

Sari-Yar, una cum *Clematide Vitalba*, ca. 50 m, fol. (26. I. — No. 898). — Bithynia: circa Hendek, in ima valle Ulu-Dere, veteribus *Platanis* implexa, ca. 300 m, fol. fr. (3. II. — No. 759); ibidem, ad radices montis Yilman, in dumetis ad rivulum, ca. 350 m, fol. (25. VI. — No. 838).

### *Dioscoreaceae.*

*Tamus communis* L. — Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in silva mixta, ca. 1350 m, fr. (5. VIII. — No. 452).

### *Juncaceae.*

*Luzula Forsteri* DC. — Bithynia: circa Hendek, ad radices montis Yilman (vallis Ulu-Dere), in dumetis ad rivulum, ca. 350 m, fol. (26. VI. — No. 837); ibidem, in latere vallis Isak-Oglu-Dere in fageto, ca. 400 m, frequentior (27. VI. — No. 130).

*Luzula silvatica* (Huds.) Gaud. (= *Luzula maxima* DC.). — Paphlagonia: in declivitate boreali montis Büyük-Ilgaz-Dagh, in abieteto copiose et gregatim, ca. 1700 m (28. VII. — No. 376).

*Juncus lampocarpus* Ehrh. — Circa Byzantium: supra pagum Rumeli-Kavak in collibus, apud viam. (12. VI. — No. 9).

### *Cyperaceae.*

*Scirpus Holoschoenus* L. var. *australis* (L.) Koch. — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai, in pineto, una cum *Iride Kerneriana* et *Phragmite communi* in humida lacuna, ca. 1350 m (18. VII. — No. 279).

*Carex remota* L. — Bithynia: circa Hendek, in valle Su-Atak-Dere, in fageto ad rivulum, ca. 500 m (26. VI. — No. 106); ibidem, in valle Isak-Oglu-Dere, ad rivulum, ca. 250 m (27. VI. — No. 836).

*Carex Grioletii* Roem. — Bithynia: circa pagum Bichki-Dere (jugum Kurmaly-Dagh), in convalle angusta humida, in silva umbrosa (fagetum rhododendrosum) ad fontem, ca. 300 m, rara (30. VI. — No. 141).

The finding of *C. Grioletii* in Bithynia is of great importance, for it creates the connecting link between its occurrences in Northern Persia and the Pontus mts., on the one hand, and its area in Western Mediterraneïs (Italy, Spain) on the other[1]).

[1]) See A. Béguinot, 6; Pastuchow, 56, p. 33. Its range in Northern Asia Minor seems to be interrupted in Northern Paphlagonia (cp.: Czeczott, 18, p. 57).

*Carex maxima* Scop. (= *C. pendula* Huds.) — Bithynia: circa Hendek, in valle umbrosa Su-Atak-Dere, in fageto ad rivulum, una cum *Carice remota*, ca. 500 m (26. VI. — No. 105).

## *Gramineae.*

*Pennisetum orientale* Rich. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in fissuris saxorum, ca. 900 m, frequentior (5. VII. — No. 157).

*Sorghum halepense* L. — Circa Byzantium: supra pagum Rumeli-Kavak, in macchia (16. VIII. — No. 641).

*Andropogon Ischaemum* L. — Paphlagonia: inter oppida Changri et Tukht, in collibus stepposis, solo gypsaceo, una cum *Gypsophila Henrici*, ca. 1000 m, copiose (11. VII. — No. 193).

*Stipa Lagascae* R. et Sch. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in saxosis stepposis, una cum *Stipa barbata*, ca. 900 m (5. VII. — No. 848).

*Stipa pontica* P. Smirn. — "*Stipa pontica* P. Smirn. sp. n.", Gos. Timiriaziewskij Inst. Moskwa 1929. — ? Galatia: sub cacumine montis Eldiven-Dagh, in stepposis, ca. 1500 m copiose (non lecta). — Paphlagonia: in declivitate meridionali stepposa montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 1950 m, fr. imm. (26.VII. — No. 954).

*Stipa barbata* Desf. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in saxosis stepposis, una cum *Stipa Lagascae*, ca. 900 m, frequentior (5. VII. — No. 162).

*Piptatherum holciforme* M. B. — Galatia: supra oppidulum Arab, in declivitate occidentali montis Eldiven-Dagh, in parte superiore vallis Yaila-Chai, in limite pineti rari et steppae, ca. 1450 m, rarum (18. VII. — No. 307).

*Calamagrostis epigeios* (L.) Roth. — Galatia: supra oppidulum Arab, in dumetis humidis ad fontem in valle Yaila-Chai (mons Eldiven-Dagh), ca. 1450 m (18. VII. — No. 308).

*Holcus lanatus* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia, frequens. (12. VI. — No. 43).

*Avena barbata* Brot. — Circa Byzantium: in collibus supra pagum Sari-Yar, ad vias copiose (12. VI. — No. 18).

*Avena versicolor* Vill. var. (nov.) ***subcondensata*** Czeczott. — Panicula forma typica condensatiore, pedicellis strictis, foliis angustioribus, nervo medio perspicue carinato, crassiusculo.

Paphlagonia: in graminosis alpinis ad cacumen montis Büyük-Ilgaz-Dagh, ca. 2500 m (24. VII. — No. 931).

The existence in Asia Minor of *Avena versicolor* in its typical form seems to me doubtful, for the specimens from the only locality cited for A. *Scheuchzeri* (= *A. versicolor*) by Boissier: "mons Bousdouandagh Ponti Lazici supra Khabackhar 8000", Balansa, agree well with my new variety.

*Phragmites communis* Trin. — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai (mons Eldiven-Dagh), in pineto, una cum *Iride Kerneriana* et *Scirpo Holoschoeno* in humida lacuna, ca. 1350 m, gregatim (18. VII. — No. 293).

*Sesleria argentea* Savi. — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai (mons Eldiven-Dagh), in pineto, certis locis gregatim, ca. 1350 m (18. VII. — No. 275). — Paphlagonia: supra oppidulum Tukht, sub cacumine montis Panair-Tepe, in abieteto, ca. 1940 m (14. VII. — No. 254). In declivitate meridionali montis Büyük-Ilgaz-Dagh, in silva *Pini nigrae*, et in graminosis alpinis alt. 2200—2500 m, frequens (24. VII. — No. 914). In herbidis alpinis ad cacumen montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2300 m (26. VII. — No. 945).

*Cynosurus echinatus* L. — Circa Byzantium: supra pagum Sari-Yar, in graminosis aridis, rarus (12. VI. — No. 34).

*Melica ciliata* L. var. *micrantha* Boiss. et Heldr. — Const. Papp, Monographia specierum europaearum generis *Melicae*, Engl. Bot. Jahrb., Bd. 65, H. 2/3, 1932, p. 275—348. — Paphlagonia: supra oppidulum Tukht, in declivitate meridionali collium stepposorum in loco Chirchir-Bunar dicto, in fissuris saxorum (calcareus, marga), ca. 1400 m (12. VII. — No. 202)? Inter oppidum Changri et pagum Inekeui (ad fl. Devrez-Chai), in declivibus montis Akhlat-Dagh, loco Karavan-Sarai dicto, in stepposis, ca. 1368 m (20. VII. — No. 922).

*Briza media* L. — Galatia: supra oppidulum Arab, in latere boreali vallis Yaila-Chai, in pineto, ca. 1350 m, copiose (18. VII. — No. 278).

*Briza elatior* Sibth. et Sm. — Circa Byzantium: supra pagum Sari-Yar, in macchia et locis apertis frequens (12. VI. — No. 29).

*Briza maxima* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia et rubetis frequentior (12. VI. — No. 37).

*Dactylis glomerata* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia et in graminosis frequens (12. VI. — No. 42). — Bithynia: circa Hendek, in monte Yilman (vallis Ulu-Dere), in querceto, ca. 400 m (25. VI. — No. 835, α. *typica* Asch. et Graebn. — Syn. II, p. 379).

*Poa pratensis* L. β. *angustifolia* Sm. — Asch. et Graebn. Syn. II, p. 431. — Paphlagonia: supra oppidulum Tukht, in declivi boreali montis Bokly-Tepe, in prato subalpino per stationem pecoris tempore mercatus periodici fecundato, ca. 1700 m, copiose (14. VII. — No. 885).

*Poa alpina* L. var. *brevifolia* Boiss. herb. — Paphlagonia: in graminosis alpinis ad cacumen montis Büyük-Ilgaz-Dagh, ca. 2500 m, copiose (24. VII. — No. 341). In cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m (26. VII. — No. 944).

*Poa bulbosa* L. — Paphlagonia: inter oppida Changri et Tukht, in collibus stepposis, solo gypsaceo, una cum *Gypsophila Henrici* et *Andropogone Ischaemo*, ca. 1000 m (11. VII. — No. 192).

*Poa nemoralis* L. — Paphlagonia: supra oppidulum Tukht, in monte Panair-Tepe, in abieteto, ca. 1900 m (14. VII. — No. 255). In declivi meridio-occidentali montis Kush-Kayasy, in abieteto, ca. 1940 m (26. VII. — No. 371). Prope viculum Djazoglu (inter Sinopen et Tashköprü), in latere austro-orientali vallis Chamkeui-Su inter fruticeta *Quercuum* et *Pini nigrae* solitariae, ca. 850 m (31. VII. — No. 628).

**Festuca ovina* L. ssp. *eu-ovina* Hack. var. *paphlagonica* St.-Y.[1]). — Bull. Soc. Bot. Fr. 1924, p. 32. — Paphlagonia: in cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m (26. VII. — No. 905).

**Festuca ovina* L. ssp. *indigesta* Hack. var. *pinifolia* (Hack.) St.-Y. subvar. *phrygia* (Hack.) St.-Y. — Bull. Soc. Bot. Fr. 1924 — (= ssp. *phrygia* Hack. et Bornm. nom. in herb. Bornm. It. anat. III, 1899, No. 5672). — Paphlagonia: in graminosis alpinis ad cacumen montis Büyük-Ilgaz-Dagh, una cum *Festuca Woronowii*, *Sesleria argentea*, *Bromo cappadocico* et *Avena versicolore*, ca. 2500 m (24. VII. — No. 906).

**Festuca elatior* L. ssp. *arundinacea* Hack. var. *glaucescens* Boiss. subvar. *genuina* St.-Y. (= *F. Fenas* Lag. = var. *Fenas* Hack.) — Galatia: supra oppidulum Arab, in valle Yaila-Chai (mons Eldiven-Dagh), in dumetis ad rivulum, ca. 1450 m (18. VII. — No. 309).

"Forma! Spiculis conspicue aristatis (sed arista saepissime rupta), panicula ditiore transitum ad var. *genuinam* subvar. *mediterraneam* Hack. sistit."

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[1]) All my *Festucae* have been kindly revised and most of them (those marked with an asterisk) determined by the late Alfr. Saint-Yves (France).

**Festuca varia* Haenke ssp. *eu-varia* Hack. var. *Woronowii* (Hack.) St.-Y. — Alfr. Saint-Yves, "Contribution à l'étude des *Festuca* (subgen. *Eu-Festuca*) de l'Orient ..." Candollea, III, 1928, p. 435 (= *F. Woronowii* Hack. in Mon. Jard. Tiflis, L 24, 1912, p. 17—18). — Paphlagonia: in graminosis alpinis ad cacumen montis Büyük-Ilgaz-Dagh, una cum *Festuca ovina*, *Sesleria argentea*, *Bromo cappadocico* et *Avena versicolore*, ca. 2500 m (24. VII. — No. 356)[1].

*Festuca montana* M. B. subvar. *typica* Hack. (= *F. drymeia* M. et K.). — Bithynia: circa Hendek, in latere meridionali vallis Isak-Oglu-Dere (Kurt-Dagh), ca. 230 m (11. II. — No. 777); ibidem, in declivi meridionali montis Ohlamurluk (vallis Ulu-Dere), in querceto raro, 400—500 m, copiose (24. VI. — No. 80). In declivi montis Geuk-Tepe (jugum Kurmaly-Dagh) vallem Bichki-Dere versus, in fageto, ca. 300 m (30. VI. — No. 148). — Paphlagonia: in declivitate boreali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m (27. VII. — No. 907).

*Bromus asper* Murr. — Paphlagonia: supra oppidulum Tukht, in monte Panair-Tepe, in abieteto, ca. 1900 m (13. VII. — No. 886). In declivi meridio-occidentali montis Kush-Kayasy (jugum Ilgaz-Dagh), in abieteto, ca. 1940 m (26. VII. — No. 948).

*Bromus cappadocicus* Boiss. et Bal.? — Paphlagonia: in declivi meridionali montis Büyük-Ilgaz-Dagh, in pineto, ca. 2100 m, copiose (24. VII — No. 350); ibidem, sub cacumine eiusdem montis, in pineto raro, ca. 2400 m (24. VII. — No. 350 bis). In graminosis alpinis cacuminis Kush-Kayasy (jugum Ilgaz-Dagh), ca. 2400 m (26. VII. — No. 946 et 946 bis).

Although Freyn referred to this species specimens of *Bromus* collected by Sintenis on the same summit Büyük-Ilgaz-Dagh, I feel doubt about the corectness of my determination, for my specimens do not agree with the description of Boissier: in being glabrous (or nearly so) and in having contracted panicles. As concerns the leaves, they match better those of *B. sclerophyllus* Boiss., which species is not quite clear to me.

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[1]) The diversity in the altitude given for No. 356 here (2500 m) and in St.-Yves "Contribution ..." (2600—2700 m) has been caused by the circumstance that at the time I sent my *Festucae* to Mr. St.-Yves for determination the height of the summit of Büyük-Ilgaz-Dagh had not been calculated. I supposed then that a height near to 2710 m, which figures on some labels of Sintenis' plants, collected on the same summit, would result also from my measurements, these proved, however, to give different results (compare Part I, p. 87).

*Bromus tomentellus* Boiss. var. (nov.) ***velutinus*** Czeczott — glumis dense velutinis. — Paphlagonia: supra oppidulum Tukht, in declivi saxoso montis Bokly-Tepe ad meridiem vergente, in stepposis, ca. 1650 m (13. VII — No. 234 et No. 234 bis: e seminibus eiusdem in Horto Botanico Cracoviensi eductus).

From seeds of No. 234 I cultivated this plant in the Botanical Garden in Cracow. The panicles proved to be loose and the spikelets hanging on long thin stalks, which feature according to Boissier is characteristic of *B. cappadocicus*. In *B. tomentellus* they ought to be contracted.

*Bromus tectorum* L. var. *ponticus* (C. Koch) Asch. et Graebn. — Paphlagonia: supra oppidulum Tukht, in angustiis in declivi meridionali collium stepposorum in loco Chirchir-Bunar dicto, ca. 1500 m (12. VII. — No. 209).

*Bromus patulus* M. K. var. *anatolicus* Hack. (= *B. anatolicus* Boiss. et Heldr.). — Galatia: Angora, in collibus trachyticis ad orientem urbis, in stepposis saxosis, ca. 900 m (5. VII. — No. 163).

*Brachypodium silvaticum* (Huds.) Roem. et Schult. — Paphlagonia: in declivi meridio-occidentali montis Kush-Kayasy (jugum Ilgaz-Dagh), in abieteto, ca. 1900 m (26. VII. — No. 947).

*Brachypodium silvaticum* Roem. et Schult. var. *dumosum* (Vill.) Beck. — Bithynia: circa Hendek, in monte Ohlamurluk (vallis Ulu-Dere), in fageto-querceto, ca. 400 m (24. VI. — No. 62).

*Brachypodium silvaticum* Roem. et Schult. var. (nov.) ***glabratum*** Czeczott — foliis glabris. — Bithynia: in valle Bichki-Dere, in declivi occidentali montis Geuk-Tepe (jugum Kurmaly-Dagh), in fageto, copiose, ca. 300 m (30. VI. — No. 143).

*Brachypodium pinnatum* (L.) P. Beauv. — Bithynia: circa Hendek, in monte Ohlamurluk (vallis Ulu-Dere), in querceto raro, ca. 450 m (24. VI. — No. 76 — var. *australe* Gr. et Godr.); ibidem, in declivi meridio-orientali montis Yilman (vallis Ulu-Dere), in querceto, ca. 450 m (25. VI. — No. 415 — var. *rupestre* Rchb.?).

*Triticum vulgare* Vill. subsp. *durum* (Desf.) Alef. — Bithynia: circa Hendek, in agro triticeo (26. VI. — No. 115).

*Aegilops ovata* L. — Circa Byzantium: supra pagum Sari-Yar, in locis apertis, macchia destitutis, gregatim (12. VI. — No. 5 et No. 5 bis — e seminibus eiusdem in Horto Botanico Cracoviensi educta).

*Aegilops truncialis* L. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in stepposis saxosis, ca. 900 m (5. VII.

— No. 561 et No. 561 bis — e seminibus eiusdem in Horto Botanico Cracoviensi educta).

*Hordeum bulbosum* L. — Circa Byzantium: supra pagum Sari-Yar. in locis apertis, macchia destitutis. copiose (12. VI. — No. 38).

*Elymus caput Medusae* L. — Galatia: supra Angora, in collibus trachyticis ad orientem urbis, in stepposis saxosis, ca. 950 m (5. VII. — No. 170). — Paphlagonia: inter oppidum Changri et pagum Inekeui (ad fl. Devrez Chai), in loco Karavan-Sarai dicto, sub cacumine montis Akhlat-Dagh, in stepposis, ca. 1368 m (20. VII. — No. 923).

# Coniferae.

## *Pinaceae.*

*Pinus Pinea* L. — Circa Byzantium: supra pagum Sari-Yar, in collibus macchia obtectis, ca. 150 m (2. III. — No. 750 — probabiliter non spontanea); ibidem (12. VI. — No. 10).

*Pinus silvestris* L.[1]) — Paphlagonia: in declivitate orientali montis Büyük-Ilgaz-Dagh, silvas efficiens, ca. 1700 m (28. VII. — No. 551). In collibus circa Edjevid, in declivitatibus ad orientem et occidentem spectantibus. ca. 1100 m (6. VIII. — No. 683).

*Pinus silvestris* L. var. *subalpina* Fomin — Gymnospermen des Kaukasus und der Krim, p. 22. — Bithynia: circa Hendek, sub cacumine montis Cham-Dagh, una cum *Pino nigra*, ca. 800 m (14. II. — No. 830).

*Pinus hamata* (Stev.) Fom. — l. c. p. 23. — Paphlagonia: supra oppidulum Tukht, ad radices montis Bokly-Tepe, in angustiis prope cataractam, alt. 1400—1450 m (14. VII. — No. 489). In collibus circa Edjevid, una cum *Pino silvestri* silvam efficiens, ca. 1100 m (6. VIII — No. 559).

*Pinus armena* Koch (= *P. montana* var. *caucasica* Medw.) — Fomin. l. c. p. 26. — Paphlagonia: supra oppidulum Tukht, in regione subalpina in limite stepparum et silvarum, arbores solitariae sub cacumine montis Panair-Tepe, ca. 1850 m (14. VII. — No. 259). Supra vicum Djazoglu (inter Sinopen et Tashköprü), in cacumine montis Khadji-Aghach. ca. 1760 m, arbusculae (1. VIII. — No. 434). Supra oppidulum Küre, in declivitate montium ad orientem vergente, una cum *Pino nigra*, *Cisto salviifolio*, *Rhododendro flavo* et *Vaccinio Arctostaphylo* densa fruticeta (in loco silvae destructae?) efficiens, ca. 1250 m, frutex (5. VIII. — No. 684).

*Pinus armena* Koch var. *parvifolia* Fom. — l. c. p. 27. — Paphlagonia: supra oppidulum Küre, una cum praecedente, frutices et arbusculae nanae (5. VIII. — No. 460 et 460 bis).

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[1]) My determinations of *Pinus silvestris* and its forms have been kindly revised and rectified by the late Prof. O. Fomin (Kiev, Ukraine).

*Pinus nigra* Arnold var. *Pallasiana* Antoine[1]) — K. Ronniger in Verhandl. zool. botan. Gesellsch. LXXIII, 1923, p. 127. — Bithynia: supra oppidulum Hendek, in cacumine montis Cham-Dagh, una cum *Pino silvestri* et *Quercu* sp. ca. 800 m, substrato arenaceo (14. II. — No. 834). — Galatia: supra oppidulum Arab. in latere boreali vallis Yaila-Chai, silvam raram efficiens, ca. 1300 m (17. VII. — No. 274). — Paphlagonia: supra oppidulum Tukht, in declivitate ardua stepposa montis Bokly-Tepe. arbores solitariae. ca. 1400 m (13. VII. — No. 555); ibidem, arbores solitariae sub cacumine montis Panair-Tepe, in regione subalpina in limite stepparum et silvarum. ca. 1850 m (14. VII. — No. 555 bis). In declivitate boreali jugi Ilgaz-Dagh, arbores solitariae inter frutices *Fagi* et *Coryli* ca. 1500 m (28. VII. — No. 560). In declivi orientali montis Büyük-Ilgaz-Dagh, silvas vastas efficiens, ca. 1700 m, strobili (28. VII. — No. 560 bis). Prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere vallis Chamkeui-Su ad meridio-orientem vergente, arbores solitariae inter frutices *Quercuum*, ad scoriam fodinae derelictae, ca. 850 m (31. VII. — No. 474). Supra oppidulum Küre, arbusculae et frutices in declivi montium ad orientem spectante (probabiliter in loco silvae destructae), ca. 1250 m, copiose (5. VIII. — No. 556). Circa Ineboli, arbusculae in macchia litorali, una cum *Abiete Nordmanniana*, alt. 1—2 m supra mare (8. VIII. — No. 558 et 558 bis).

*Pinus Brutia* Ten. (= *P. Pityusa* Stev. — Bernhard, Die Kiefern Kleinasiens, p. 46, = *P. Brutia* var. *caucasica* Lipsky, Acta Horti Petrop. XIV, p. 309, = *P. Pityusa* Stev. var. *Stankewiczi* Sukatch., Journ. bot. XXXV, 3 No. 1, 1906, p. 34—38).

Ins. Prinkipo: in media parte insulae silvas constituens, una cum *Arbuto Unedine, Quercu coccifera, Erica arborea*, strob. maturi (26. II. — No. 845); ibidem (a. 1930 leg. Musa Sabri — No. 681 et 682). Circa Byzantium: supra pagum Rumeli-Kavak, in macchia, junior arbor solitaria (16. VIII. — No. 478).

A special paper on the distribution of *P. Brutia* Ten. and *P. halepensis* Mill., their taxonomical differences, and the relation of the former to *P. Pityusa* Stev., is in preparation. While drawing up the map of their distribution, I succeeded in establishing the fact

[1]) *Pinus maritima* Mill. ssp. *Pallasiana* (Lamb.) Schwz. according to O. Schwarz "Über die Systematik und Nomenklatur der europäischen Schwarzkiefern", p. 237.

that their areas overlap in the islands of the Archipelago and probably in Northern Syria[1]). Hence the existence of *P. halepensis* in westernmost Asia Minor is not excluded. Among the hundreds of specimens revised by me two — originating in Turkey — match *P. halepensis* better than *P. Brutia*. These are: 1) Gamandra on the Kodja-Ili peninsula (near Constantinople), collected by Abd-Ur-Rahman (Aznavour), 2) No. 2828 from near Smyrna, collected by K. Krause in 1927. Unfortunately they represent sterile branches, not permitting of a certain determination[2]). In both cases we are perhaps dealing with planted trees.

A thorough revision of the materials concerning *P. Brutia* and *P. halepensis* in the herbaria of Kew, British Museum, Paris, Berlin, Brno, Vienna, Florence, Montpellier and many others has convinced me that these represent two distinct species. Below I give some of their characters, which will facilitate their recognition in more cases, than it has been possible hitherto.

In distinguishing *P. halepensis* from *P. Brutia* neither the length and colour of the needles[3]) nor the presence of flat or bulging apophyses is, in my opinion, of great importance. The following characters seem to be more or less constant:

| ***Pinus halepensis*** Mill. | ***Pinus Brutia*** Ten. |
|---|---|
| **Bark of young shoots.** | |
| Smooth, pale yellowish-gray (often with a tint of olive-green)[4]). | Rough (marked by scars of numerous deciduous scales), reddish-brown[5]). |
| **Sheaths (vaginas) of the uppermost young needles.** | |
| Dirty white with a slight admixture of yellow, up to 7—9 mm long, $^3/_4$—1 mm broad. | Shining white with a golden tint. 9—14 mm long, $1\frac{1}{2}$—$1^3/_4$ mm broad (seldom narrower). |

[1]) Their joint occurrence in many localities of Dalmatia is of no great phytogeographical importance since *Pinus Brutia* is there artificially introduced.

[2]) Unless I discover some distinguishing features in the anatomy of the needles.

[3]) Distinctly depending on the season of the year: the needles, which are vividly green in the early spring, become towards the end of the almost rainless Mediterranean summer yellowish and scorched.

[4]) The best match is Perl Gray in "Répertoire de couleurs des fleurs, des feuilles et des fruits . . ." by R. Oberthür et H. Dauthenay (1905), Plate 355, tint No. 4.

[5]) Corresponds to Burnt umber or Brownish terra cotta in the above book, Plate 304 and 334.

**Pinus halepensis** Mill. *(cont.)* — **Pinus Brutia** Ten.

Male flowers.

| *Pinus halepensis* Mill. | *Pinus Brutia* Ten. |
| --- | --- |
| Clusters of elongated or orbicular shape, containing about 15—36 flowers, which are narrow-cylindrical and dark-brown (in sicco)[1]) | Clusters suborbicular (often transversely broader), containing few flowers, 5—8—10[2]) of ovate-conical shape, which are light brown or yellowish (in sicco). |
| Scales with a smooth margin, which under the microscope is seen to have small more or less regular acute teeth[3]). | Scales broader than in *P. halepensis*. with a torn margin, which under the microscope proves to be deeply and irregularily erose, the "teeth" having blunt tips[3]). |

Female flowers and cones.

| *Pinus halepensis* Mill. | *Pinus Brutia* Ten. |
| --- | --- |
| On long stalks, most often 10 to 22 mm, solitary, more seldom in pairs. | On short stalks, most often 3 to 5 mm, or almost sessile, 2 to 5 (or more), most often in pairs. |
| Scales in flowers: tightly pressed tongue-shaped seed-bearing scales are bent down, bract-scales only slightly protruding from beneath them. The hanging down of the scales may be noticed also in very young cones, when they are but 10—12 mm long (corresponding then to the umbones of mature cones). | Scales in flowers: looked at from the side chiefly the bract-scales are visible, which are turned up. In very young cones the ascending of the scales may be still noticed; sometimes they are even scutelliform. |
| Cylindric-conical mature cones are pendulous; umbones of central scales are distinctly raised and often percursed by an acute transverse keel (very seldom flat). | Ovoid-conical[4]) mature cones are slightly ascending[5]) or at right angles to the branch bearing them; umbones of central scales concave or flat. |

[1]) The only fresh flowers of *P. halepensis* seen by me, received recently from Tunis and Algiers, are of a light yellowish-brown (fawn) colour. The colour of fresh flowers in *P. Brutia* is unknown to me.

[2]) According to Medwedew (49, p. 24) and Fomin (22, p. 31), 10—20.

[3]) The drawings of the scales will be found in the above-mentioned paper on *P. halepensis* and *P. Brutia*.

[4]) Conspicuously broader at the base relatively to the length than in *P. halepensis*. In connection with this shape the central scales of *P. Brutia* are broader

*Abies Nordmanniana* (Link) Spach var. *leioclada* (Stev.) C. Koch — C. Steven, De pinibus Taurico-Caucasicis, Bull. Soc. Imp. Natur. Moscou, I, 1838, p. 44 — (= *A. Bornmülleriana* Mattf. — J. Mattfeld, Zur Kenntnis der Formenkreise der europäischen und kleinasiatischen Tannen, 46, p. 239). — Paphlagonia: supra oppidulum Tukht, in cacumine et in declivi boreo-occidentali montis Panair-Tepe, ca. 1900 m, arbores mediocres silvam densam in limite stepparum et silvarum efficiens (14. VII. — No. 258). In convalle declivitatis meridio-occidentalis montis Kush-Tepe (jugum Ilgaz-Dagh) silvulam constituens, ca. 1940 m (26. VII. — No. 943). In declivitate boreali montis Büyük-Ilgaz-Dagh silvas vastas, umbrosas efficiens, ca. 1700 m (28. VII. — No. 476). Supra Edjevid, in declivitatibus collium in silva mixta (*Fagus, Sorbus torminalis, Pinus nigra, P. hamata, P. silvestris*), ca. 1100 m (6. VIII. — No. 553)? Supra oppidulum Küre, in declivitate montium ad orientem vergente, arbores solitariae inter frutices *Pini nigrae, P. armenae, Cisti laurifolii, Vaccinii Arctostaphylo* etc. (in loco silvae destructae?), ca. 1250 m (5. VIII. — No. 554 et 554 bis). Supra vicum Djazoglu (inter Sinopen et Tashköprü), in declivi boreo-occidentali montis Khadji-Aghach, pineto admixta, alt. 1300—1760 m (non lecta). Circa Ineboli, in macchia litorali, una cum *Pino nigra*, solitariae (non lecta).

In my opinion it is not right to segregate the fir growing in Bithynia and Paphlagonia from *Abies Nordmanniana* Spach. I have not been able to discover any difference in the anatomy or morphology of the leaves; neither the form nor the dimensions of seeds and scales of cones exhibit any marked difference. A characteristic feature: the presence of hanging branches in the lowermost part of the trunk (see Plate XVI) is peculiar as well to *A. Nordmanniana* as to *A. Bornmülleriana* Mattf. The most important characters which according to Mattfeld[1]) distinguish his *A. Bornmülleriana* from *A. Nordmanniana* are: resiniferous buds and glabrous young twigs in the former, devoid of resin buds and hairy branches in the latter.

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relatively to their length, while in *P. halepensis* both dimensions of the central scales are equal or nearly so.

[5]) It must be remembered that the position taken by the cones in relation to the branches bearing them is a character which has no validity in the young states of cones.

[1]) L. c. p. 238 and "Die in Europa und dem Mittelmeergebiet wildwachsenden Tannen", Mitt. Deutsch. Dendr. Ges. No. 35, 1925, p. 24.

In addition to this, according to this author, there is a break between their distributional areas[1]).

After a careful investigation of the materials of both firs in the herbaria of: Kew, Paris, Berlin, Brno (2) and Vienna (2), and collecting the appropriate data from the literature and from my own field-observations (see Table VI), I can prove that there is no break of the area between the occurrences of the fir in Paphlagonia and those in Eastern Lasistan (Pontus mts.) — which part of Asia Minor is inhabited by indubitable *Abies Nordmanniana*[2]). 1) Nowack (54, p. 8) mentions *Abies* as being present in the mountains of Nebjen-Dagh (about 25 km to the south-southeast of Bafra). 2) Wiedemann collected the fir near Tokat. Both localities are situated in the space where Mattfeld has assumed a total lack of firs and the latter is just in the middle position between the ranges of the two species of fir spoken of. 3) In Central Paphlagonia (near the eastern limit of the area of *Abies Bornmülleriana* according to the map of Mattfeld in "Die Pflanzenareale") the fir has probably found the optimal conditions for its existence: in the inland mountain-chain of Ilgaz-Dagh it constitutes at the altitude of 1700—1900 m extensive dense and shady Abieteta, in the coast ranges between Kastamuni and Ineboli (near Edjevid and Küre) it takes part at 1000—1500 m in the rich mixed forests together with *Fagus, Taxus, Quercus Bornmülleriana* and *Q. Hartwissiana, Pinus nigra, P. silvestris, Sorbus torminalis, Acer* and *Fraxinus* and a number of Colchic shrub species. At a distance of 25—30 km from Küre — near Ineboli — we find still solitary *Abies* trees growing in the macchia at the very level of the sea. This sight is so unusual that it has attracted the attention even of non-botanists: Nowack[3]) has observed it, as I also have, near Ineboli and besides he mentions fir as descending to the level of the sea also from other localities situated between Ineboli and Sinope. Past Sinope he has seen it still in macchia near Kubafet, at 250 m (54, p. 7). Would it be a conceivable thing for a species to stop in its distribution in the region, where it displays obviously quite an unusual range of adaptation to the external conditions?

Passing to the other distinguishing features mentioned above, I must state that the amount of resin on buds and twigs is subject

[1]) See Map 14 in "Die Pflanzenareale", 1. Reihe, H. 2 (1926).

[2]) See Map in fig. 4 in Czeczott, 18, p. 47.

[3]) In Fr. Markgraf, 45, p. 363.

to great variation, depending probably 1) on the season of the year: winter and autumn specimens seem to be less resinous than those collected in the summer time; 2) on the degree of the dryness of climate: specimens collected by me in the interior of Anatolia — near Tukht, which is situated in the limit zone between the steppe and forest regions, seem to be much more resinous than the specimens from the forest region of Northern Anatolia, 3) on the part of the tree and the presence or absence of cones: fertile twigs and such taken from the top of the tree bear more resin than the lower sterile branches. It must be born in mind that, in view of the inadequecy of field observations and the presence in herbaria of only scanty materials on *Abies* from the western and central parts of Northern Asia Minor, the above statement is merely a suggestion requiring confirmation.

As concerns hairiness, Paphlagonian, Bithynian and Mysian specimens very often possess a few hairs in the basal part of the younger twigs; on the other hand the degree of hairiness of the Caucasian fir is also variable. According to Medwedew (49, p. 36): „Bei *A. Nordmanniana* pflegt der Grad der Behaarung der Schößlinge verschieden zu sein und an manchen Bäumen kann man nicht selten nebeneinander dicht mit Härchen bedeckte und fast nackte Zweige finden." To such specimens has to be applied the name var. *leioclada*, used by Steven incorrectly in connection with *A. pectinata* DC., which species he supposed to exist in the Caucasus in addition to *A. Nordmanniana* Spach. (Medwed. l. c. p. 36)[1]). Koch marked on the labels of his specimens of fir brought from the Pontus mts.: *Abies leioclada* Stev., and of those from the Bithynian Olympus — *Pinus Nordmanniana* Stev. β *leioclada* (in the herbarium of Berlin-Dahlem).

[1]) In the above-quoted paper by Steven "De pinibus . . ." p. 44 we find on this interesting subject the following: Szovits procured for Steven some fruitless specimens of fir originating "e jugo Adshar Gurieli", which specimens Steven described in the words: "Ramuli mei absque flore vel fructu simillimi toto habitu et foliis *P. Piceae* europeae, sed glabri, qui in hac constanter pubescunt. Unde suspicor propriam esse speciem, *P. leioclada* nominandam . . ."

This, as well as the above quotation from Medwedew's work, would seem to suggest that the area of *A. Nordmanniana* var. *leioclada* is not limited to Asia Minor only, but probably extends also to Transcaucasia. Perhaps var. *leioclada* represents a form more adapted to xeromorphic conditions, and which replaces *A. Nordmanniana* in the mountains bordering Colchis from the south and in other localities situated nearer to the steppe regions?

TABLE VI.

To show inconstancy of characters used to distinguish *Abies Nordmanniana* Spach from fir growing in western and central parts of Northern Asia Minor.

| Locality and altitude | No. | Collector | Date | Herbarium | Characters: Resin on buds and twigs | Characters: Hairiness on young twigs | Remarks: Specimen is represented by branches |
|---|---|---|---|---|---|---|---|
| Bithynia: | | | | | | | |
| 1. Mt. Olympus | 1 | Karl Koch | — | Berlin | absent | absent | — |
| 2. Brussa (probably Olympus) | — | „ | — | „ | absent or scanty | few hairs | — |
| 3. Mt. Olympus | — | Thirke | 1852 | „ | — | traces | — |
| „ | — | illegible | — | „ | absent | present | sterile |
| „ | — | Tölg | 3. VI. ? | Vienna (Un.) | absent | absent | sterile |
| „ 11- -1700 m | 5564 | Bornmüller | 31. V. 1899 | Berlin, Vienna (Mus. and Univ.), Kew, Paris, Brno | abundant at the base of flowers, often lacking on sterile twigs | absent or few hairs present | sterile and with male flowers |
| Mt. Olympus | 19 | Pauli | — | Berlin | abundant on flowering twigs, almost lacking on the sterile ones | absent on flowering twigs, present on the sterile ones | sterile and bearing male flowers |
| 4. Between Boz-Uyük and Inegöl | — | Bernhard | 10. XII. 1927 | Berlin | absent | absent (one twig hairy or perhaps mouldy) | — |
| 5. Gökdagh 1451 m | 134 | Dingler | 5. V. 1892 | Berlin | absent | absent | — |
| 6. Gökdagh: south of Kyeltepe | 219 | „ | 13.VIII. 1892 | Berlin | not all buds resinous | absent | — |
| Paphlagonia: | | | | | | | |
| 7. Tukht (limit of steppe- and forest-zone), 1900 m | 258 | Czeczott | 14. VII. 1925 | Cracow (Acad.) Warsaw (Herb. Czeczott) | abundant | absent | sterile, with cones and male flowers |
| 8. Kush-Tepe (Ilgaz-Dagh, limit of steppe- and forest-zone), 1940 m | 943 | „ | 26. VII. | „ | abundant | absent | with male flowers |
| 9. Büyük-Ilgaz-Dagh, 1700 m | 476 | „ | 28. VII. | „ | present | mostly absent, one twig with few hairs | sterile |
| 10. Tossia: Giaur-Dagh | 3988 | Sintenis | 17. V., 29. VII. 1892 | Berlin, Vienna (Mus. and Univ.), Kew, Paris, Brno | abundant | absent | with male flowers or with cones |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 11. Edjevid. 1100 m | 553 | Czeczott | 6. VIII. 1925 | Warsaw, Cracow | present | most twigs with numerous hairs | sterile |
| 12. Küre. 1250 m | 554 | „ | 5. VIII. | „ | abundant on fertile twigs, scarce on sterile ones | absent or few hairs present | sterile and bearing cones |
| 13. Küre-Nahas (= Küre) | 5142 | Sintenis | 28. VIII. 1892 | Vienna (Mus. and Univ.), Kew, Paris, Brno | abundant or scarce | present[1]), more seldom absent | with cones |
| 14. Ineboli | 35 | „ | 1889 | Berlin | absent | absent or present | sterile |
| 15. Ayadjik near Sinope | — | Bernhard | — | „ | scarce | absent or few hairs present[2]) | sterile |
| Western Pontus mts. | | | | | | | |
| 16. Tokat | — | Wiedemann | 1835 | Vienna (Mus. and Univ.) | absent | some twigs glabrous, other bearing few or numerous hairs | sterile |
| Eastern Pontus mts. | | | | | | | |
| 17. Armenia Turcica. Szanschak Gümüschkhane. 1) Omaler | 5546 | Sintenis | 13. V. 1894 | Berlin, Brno | absent or scarce | few hairs on all twigs | — |
| 18. 2) Darsosdagh | 5819 | „ | 6. VI. | Vienna (Mus. and Univ.), Kew, Brno | present (not all buds resinous) | mostly hairy | sterile and with male flowers |
| 19. 3) Ardas | 2106 | „ | 1890 | Kew | present | absent or few hairs present | — |
| 20. 4) Karagöll-Dagh | 5119b | „ | 5. 9. III. 1890 | Brno (?) | scarce | dense | — |
| 21. Valley of Khabakhor (Lazistan), 2000 m | — | Balansa | 1866 | Vienna (Mus.) Paris | present | indistinct (twigs mouldy) | with cones |
| | | | | Kew | scanty | present | with cones |
| 22. "Oberhalb Trebizonds" 3000′[3]) | — | Karl Koch | 1836 ? | Berlin | absent | one twig feebly hairy, others glabrous | sterile |

[1]) One of the twigs is as densely covered with hairs as is the case in most typical specimens of *A. Nordmanniana* from Transcaucasia. [2]) On the label we read: „Von einem Schattenzweig. Die Zweige sind sehr schwach behaart". Dr. Mattfeld has determined this specimen as *A. Nordmanniana*. [3]) On the label is marked only „Pontisches Gebirge", but I suppose that the data in Kochs "Beiträge zu einer Flora des Orients", Linnaea, XXII, p. 295 (34) apply to this specimen. We read there: "Oberhalb Trebizond auf Augitoporphyr ca. 3000′ hoch" and also: "Das pontische Gebirge, südlich bis Tschorukspalte herab, ist überhaupt reich an Gehölzen, auch an Nadelhölzern. Auf der Nordseite wächst auf einer Höhe von 3000—7000 Fuß die prächtige Tanne des Orients . . . Außerdem kommt noch auf der Nordseite des pontischen Gebirges und namentlich oberhalb Trebizonds die Abart der Weißtanne vor, welche Steven als *P. Picea* L. *β leioclada* unterschieden hat."

The instability of the features used by Mattfeld to distinguish his new species *A. Bornmülleriana* from *A. Nordmanniana* is clearly seen from the above table (VI), in which the localities are arranged in the direction from west to east.

Taking all this into consideration I presume that only one species of fir — *Abies Nordmanniana* (Link.) Spach is distributed throughout Northern Anatolia — from Mt. Olympus in the west to Lazistan in the east, where it joins the Caucasian area of the same fir. Yet, considering that the Anatolian specimens often display the total lack of hairiness and if present, hairs are always scanty, we may distinguish — following Steven and Koch — the variety *leioclada*, which perhaps is present also in Transcaucasia.

*Thuja orientalis* L. — Circa Byzantium: San-Stefano, in horto (25. II. — No. 844).

*Cupressus sempervirens* L. f. *pyramidalis* Targ. — Circa Byzantium: supra pagum Sari-Yar, in horto (26. I. — No. 840). San Stefano, in horto (25. II. — No. 843). — Paphlagonia: Zunguldak, in horto (11. VIII. — No. 643).

*Cupressus sempervirens* L. f. *horizontalis* Mill. — Circa Byzantium: prope pagum Rumeli-Kavak, arbores magnae in ima valle ad viam (16. VIII. — No. 895).

*Juniperus Oxycedrus* L. a. *microcarpa* Neil. (= subsp. *J. rufescens* Link. — Asch. u. Graebn., Syn. I, 1913, p. 384). — Circa Byzantium: supra pagum Sari-Yar, in macchia copiose, ca. 60 m (25. I. — No. 842); ibidem, solo quarcitico, passim gregatim (12. VI. — No. 27), — Ins. Prinkipo: in macchia et in pineto raro, copiose, una cum *Arbuto Unedine, Quercu coccifera, Erica arborea* (26. II. — No. 846). — Paphlagonia: supra oppidulum Tukht, in declivitate orientali collium stepposorum in loco Chirchir-Bunar dicto, ca. 1550 m, copiose (12. VII. — No. 221). Prope pagum Yailadjik, in latere occidentali vallis Ilgaz-Su, una cum *Cotoneastre integerrima, Berberide crataegina, Rosa* sp. etc., ca. 1130 m, frutices ad 3 m alti (27. VII. — No. 368).

*Juniperus nana* Willd. — Paphlagonia: supra oppidulum Tukht, in cacumine montis sine nomine (vicini monti Panair-Tepe), ca. 1850 m, copiosissime (14. VII. — Non lectum). Sub cacumine montis Kush-Kayasy (jugum Ilgaz-Dagh), frutices ad 5—10 cm alti, ca. 2 m lati, alt. 2200 m copiosissime (26. VII. — No. 367). Supra vicum Djazoglu (inter Sinopen et Tashköprü), in summo monte Khadji-Aghach, ca. 1760 m (1. VIII. — No. 935). Supra oppidulum Küre, in declivitate montium ad orientem vergente, una cum *Pino nigra,*

*Cisto salviifolio, Rhododendro flavo* et *Vaccinio Arctostaphylo* fruticeta in loco silvae destructae efficiens, ca 1150 m, forma galbulis magnis, ad 12 mm diametro (5. VIII. — No. 687).

In the latter locality this subalpine shrub descends unusually low.

*Juniperus isophyllos* C. Koch? — Medwedew, Bäume und Sträucher des Kaukasus, p. 66 — Fomin, Gymnospermen des Kaukasus und der Krim, p. 47. — Paphlagonia: inter Tashköprü et pagum Kuru-Chai (Sinopen versus), aliquot arbores et frutices juxta viam, praeterea in limitibus agrorum cultorum, in montosis supra vallem Geuk-Irmak, una cum arboribus *Pistaciae muticae*, fruticibus *Berberidis* et *Quercus*, et plantis stepposis, alt. 700—800 m (30. VII. — No. 390).

The specimens collected bear fruits and no sign of male flowers is visible. This is the reason why I have not referred it to the closely related *J. excelsa* M. B. Outside the region of Dchorokh *J. isophyllos* C. Koch has not been hitherto indicated for Asia Minor[1]).

## *Taxaceae.*

*Taxus baccata* L. — Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in silva mixta (*Fagus, Abies, Quercus, Acer, Carpinus* etc.), ca. 1400 m, copiose (5. VIII. — No. 441).

[1]) Anyhow it is not mentioned in Krause's "Die Gymnospermen der Türkei" (39). Almost simultaneously has been established its presence in the Crimea (see Wulff, 92. I, p. 41).

## Filicales.

### *Polypodiaceae.*

*Ceterach officinarum* Willd. — Circa Byzantium: ad moenia castelli supra pagum Rumeli-Kavak, in fissuris (26. I. — No. 873); ibidem (16. VIII. — No. 894). — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere meridio-orientali vallis Chamkeui-Su, in fissuris rupium, ca. 850 m (31. VII. — No. 394).

*Polypodium vulgare* L. — Bithynia: circa Hendek, in ima valle Ulu-Dere, in trunco *Carpini Betuli* veteris, ca. 500 m (3. II. — No. 745). — Paphlagonia: inter Küre et Edjevid, in fageto montis Kush-Tepe, in fissuris saxorum calcareorum, ca. 1460 m (5. VIII. — No. 671).

*Pteridium aquilinum* Kuhn (= *Pteris aquilina* L.). — Bithynia: supra oppidulum Hendek, in monte Cham-Dagh, in quercetis montanis et in dumetis in vallibus alt. 250—550 m, abunde (non lectum). — Paphlagonia: in regione subalpina montis Büyük-Ilgaz-Dagh, in pineto ca. 1850 m sito et in macchia prope Zunguldak (non lectum).

*Scolopendrium officinale* Sm. — Bithynia: circa Hendek, in valle umbrosa Ibrik-Dere, in fageto-querceto ad rivulum, ca. 450 m, copiose (31. I. — No. 729); ibidem, in valle Hussein-Sheikh-Dere (Yildiz-Dagh), in silva umbrosa (*Fagus, Carpinus*) ad rivulum, ca. 450 m (1. II. — No. 874); ibidem, in valle Ulu-Dere, in fissuris humidis rupium ad rivulum, ca. 375 m, copiose (10. II. — No. 877 et 877 bis, 23. VI. — No. 694). — Paphlagonia: inter Küre et Edjevid, in silva mixta (*Fagus, Carpinus, Abies, Taxus* etc.) montis Kush-Tepe, ca. 1460 m (5. VIII. — No. 672).

*Asplenium Trichomanes* L. — Bithynia: circa Hendek, in valle Ibrik-Dere, in fissuris saxorum (in schistosis) in silva ad rivulum, ca. 400 m (1. II. — No. 875); ibidem, prope pagum Shekhlar, in fissuris rupium ad rivulum in faucibus, ca. 200 m (7. II. — No. 878). — Paphlagonia: prope vicum Djazoglu (inter Sinopen et Tashköprü), in latere vallis Chamkeui-Su, in fissuris rupium, ca. 800 m (2. VIII. — No. 629).

*Asplenium obovatum* Viv. (= *A. lanceolatum* forma *minor* Boiss. herb.). — Ins. Prinkipo: in fissuris rupium quarciticarum in summa parte insulae (26. II. — No. 847).

Probably the easternmost occurrence, for according to the "Flora Orientalis" it is limited in its distribution to Greece and some islands of the Archipelago.

*Asplenium Adiantum nigrum* L. β. *Virgilii* Boiss. (= *A. acutum* Bory). — Circa Byzantium: supra pagum Sari-Yar, in macchia (2. III. — No. 893). — Bithynia: circa Hendek, in valle umbrosa Ibrik-Dere, in fageto-querceto, ca. 450 m, rarius (31. I. — No. 879); ibidem, in declivitate meridionali montis Ohlamurluk (vallis Ulu-Dere), in querceto raro in rupibus, ca. 650 m (3. II. — No. 869); ibidem, in lateribus arduis vallis Ulu-Dere, in querceto-fageto (3. II.— No. 882); ibidem, in valle umbrosa Isak-Oglu-Dere, ad rivulum, ca. 300 m (27. VI. — No. 132).

*Asplenium Adiantum nigrum* L. subsp. *Serpentini* Tausch forma *genuina* Milde — Luerssen, Die Farnpflanzen, 1889, p. 276. — Bithynia: circa Hendek, in valle umbrosa Ibrik-Dere, in fageto-querceto, una cum *A. Adianto nigro* var. *Virgilii* ca. 450 m, (31. I. — No. 879 bis).

*Asplenium Adiantum nigrum* L. subsp. *Nigrum* var. *argutum* Heufl. — Luerssen, l. c. p. 270. — Bithynia: circa Hendek, in lateribus arduis vallis Ulu-Dere, in querceto-fageto (3. II. — No. 882 bis).

*Athyrium Filix femina* Roth. β. *fissidens* Döll. — Luerssen, l. c. p. 139. — Bithynia: circa Hendek, in ima valle humida et umbrosa Isak-Oglu-Dere, ca. 250 m (27. VI. — No. 867). — Paphlagonia: inter Küre et Edjevid, in silva mixta montis Kush-Tepe, ca. 1400 m (5. VIII. — No. 673).

*Aspidium aculeatum* Doll. sensu Asch. u. Graebn., Syn. I, 1913, p. 57. — Bithynia: circa Hendek, in angusta valle Su-Atak-Dere, in nive, ca. 500 m, specimina vix 10—20 cm alta (10. II. — No. 883 et 889).

*Aspidium lobatum* (Sw.) Asch. — Asch. u. Graebn., l. c. p. 58. — Bithynia: circa Hendek, in valle Ulu-Dere ad rivulum, alt. 300 ad 400 m, solum rhizoma (3. II. — No. 880); ibidem, in valle angusta umbrosa Su-Atak-Dere, ca. 560 m (26. VI. — No. 100). In declivitate montis Geuk-Tepe (jugum Kurmaly-Dagh) vallem Bichki-Dere versus, in fageto-carpineto, ca. 300 m (30. VI. — No. 866). — Paphlagonia: inter Küre et Edjevid, in declivitate boreali montis Kush-Tepe, in

silva mixta (*Fagus, Carpinus, Abies, Taxus*), ca. 1400 m (5. VIII. — No. 676).

*Aspidium angulare* (Kit.) Asch. — Asch. u. Graebn., l. c. p. 60. — Bithynia: circa Hendek, in valle angusta Ibrik-Dere, in silva mixta (*Fagus, Carpinus, Quercus*) ad rivulum, ca. 400 m, specimina ad 15 cm alta (1. II. — No. 881); ibidem, in ima valle umbrosa Isak-Oglu-Dere, ca. 300 m, abunde (27. VI. — No. 132).

*Aspidium Filix mas* Sw. (= *Nephrodium Filix mas* L.). — Bithynia circa Hendek, in valle Takhtalyk-Dere, ad rivulum, ca. 220 m, solum rhizoma (6. II. — No. 841)? ibidem, in valle angusta Su-Atak-Dere, ad rivulum, ca. 500 m (10. II. — No. 876). In declivitate montis Geuk-Tepe (jugum Kurmaly-Dagh) vallem Bichki-Dere versus, in fageto, ca. 300 m, copiose (30. VI. — No. 872). — Paphlagonia: in declivitate boreali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m (28. VII. — No. 918). Inter Küre et Edjevid, in silva mixta montis Kush-Tepe, ca. 1400 m (5. VIII. — No. 670, var. *longilobum* Milde — No. 674).

The determination of No. 674 has been made by comparison with a specimen in Herbier Boissier originating from Sierra Nevada (Spain) and identified by Milde himself.

# Musci[1]).

During my twofold sojourn in Turkey I paid more attention to the mosses and lichens during the winter stay in the Cham-Dagh mts. (near Hendek) in Bithynia. This has been caused by the scarsity of other plants at this time of year and still more by the extreme abundance of mosses in beech-, hornbeam- and oak woods in the said region, catching the eyes in leafless trees. *Mnium undulatum, Neckera crispa* (very common and luxuriantly developed), *Thamnium alopecurum, Isothecium viviparum, Anomodon viticulosus, Brachythecium rutabulum,* recorded by Handel-Mazzetti and Krause from the shady Colchic forests of the vicinities of Trapezunt and other localities of the Pontus mts., are also here present. They have veen collected by me again in the summer season in the opposite extremity of the lowland Ak-Ova in the valley Bichki-Dere (northern slope of Kurmaly-Dagh chain), remarkable for its exuberant "Colchic" vegetation. The European part of the area of the first four and of *Pogonatum aloides* (first found by us in Asia Minor) more or less coincides, according to Herzog (31. p. 247), with the area of beech (more correctly: of two species of beech — *F. silvatica* L. and *F. orientalis* Lipsky). A highly interesting find in Bithynia is *Pleuropus euchloron* — this being the unique species of this tropical genus met with outside the tropics. Its distribution was considered to be limited to Lenkoran, Ghilan, Colchis and the Pontus mts.

In the subalpine region of the mighty chain of the Ilgaz-Dagh (Central Paphlagonia), in the vast coniferous forests consisting of *Abies Nordmanniana* var. *leioclada, Pinus nigra, P. silvestris* and *P. armena*, cosmopolitan and boreal species are present such as: *Dicranum scoparium, Rhytidiadelphus triquetrus, Drepanocladus uncinatus, Mnium affine.* They well agree with the occurrence in the same locality of *Oxalis Acetosella.*

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[1]) The most of the bryophytes has been determined by J. Thériot (France). Remarks in parenthesis in French are also by this author.

18*

Farther to the north — already in the coast-ranges (near Edjevid) — panboreal *Pleurozium Schreberi* together with *Dicranum scoparium* var. *polycarpum* (both new to Asia Minor) and *Mnium affine* form dense carpets in the pine forests (*Pinus silvestris, hamata,* with an admixture of *Abies* and *Sorbus torminalis*) with the undergrowth of *Rhododendron flavum, Quercus colchica* and *Q. polycarpa.* — Not far from thence, above Küre (see Plate XX, Photo 40), a noteworthy occurrence has been discovered of the beautiful Mediterranean species *Neckera mediterranea* (new to Asia Minor). It grows exuberantly on the calcareous rocks in a shady humid spot of a mixed forest, where locally *Fagus orientalis* prevails[1]). In the same spot have been found: *Hedera colchica, Asperula odorata, Scolopendrium officinale, Polypodium vulgare* and in great abundance *Saxifraga rotundifolia.*

One asterisk denotes that the species has not hitherto been recorded from the region in which it has been collected (Paphlagonia, Bithynia, vicinities of Constantinople); with two asterisks are marked species new to Asia Minor[2]). The fact that so many species of my short list are marked shows clearly how little collecting of mosses has been done in Asia Minor.

## *Dicranaceae.*

*Dicranum scoparium* (L.) Hedw. — Paphlagonia: in declivitate boreali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m (28. VII. — No. 5).

*******Dicranum scoparium* (L.) Hedw. var. *polycarpum* Breidl. — Paphlagonia: circa Edjevid, in declivitate boreo-occidentali collium in pineto-abieteto, una cum *Pleurozio Schreberi,* ca. 1100 m, copiose (6. VIII. — No. 35).

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[1]) Some remarks concerning this species and the distribution in Asia Minor of some of the mosses of our list may be found in Czeczott, 18, p. 52 and 58.

[2]) Mistakes are not excluded, for not the whole of the bryological literature concerning the Nearer East has been accessible to me. In clearing the distribution in Central and Western Asia Minor the recent paper by Bornmüller "Zur Bryophyten-Flora Kleinasiens" (11) proved to be of great use; for the Pontus mts collections of Handel-Mazzetti (29, p. 124—132), of Krause (see Reimers "Die von Prof. Dr. Krause in Kleinasien, besonders im Pontus 1926 gesammelten Leber- und Laubmoose") and of Sintenis (see Schiffner "Über die von Sintenis in Türkisch-Armenien gesammelten Kryptogamen") have been taken into consideration.

## *Grimmiaceae.*

**Grimmia campestris* Burch. — Circa Byzantium: supra pagum Sari-Yar, in declivi Bosporum versus, in macchia solo haerens, una cum *Bryo* sp., alt. ca. 115 m (25. I. — No. 26).

## *Bryaceae.*

*Bryum* sp. — "probabl. forme de *B. elegans* Pers." — circa Byzantium: supra pagum Sari-Yar, in declivi Bosporum versus, in macchia solo haerens, una cum *Grimmia campestri*, alt. ca. 115 m (25. I. — No. 36).

## *Mniaceae.*

**Mnium undulatum* (L.) Weis. — Bithynia: circa Hendek, in valle Su-Atak-Dere, ad humidam rupem praeruptam juxta cataractam, in fageto-carpineto, ca. 470 m (26. VI. — No. 9).

**Mnium affine* Bland. — Paphlagonia: in declivi boreali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m (28. VII. — No. 7). Circa Edjevid, in collibus in silva mixta (*Abies*, *Pinus*, *Sorbus*, *Carpinus* etc.), ca. 1112 m (6. VIII. — No. 8).

## *Neckeraceae.*

***Neckera mediterranea* Philib. (= *N. turgida* Jur.)[1] .— Paphlagonia: inter Küre et Edjevid, in fageto in monte Kush-Tepe, ad rupes calcareas, ca. 1460 m (5. VIII. — No. 21).

**Neckera crispa* (L.) Hedw. — Bithynia: circa Hendek, in valle Ulu-Dere, in trunco *Carpini Betuli* veteris, una cum *Hypno cupressiformi* et *Isothecio viviparo*, ca. 370 m (3. II. — No. 12 et 29); ibidem, in valle humida Hussein-Sheikh-Dere, in truncis arborum vivarum et collapsarum prope torrentem, una cum *Brachythecio rutabulo*, ca. 430 m, (4. II. — No. 14); ibidem, in valle Takhtalyk-Dere, in dumetis prope torrentem, ramos *Rhododendri pontici* obtegens, ca. 270 m (2. II. — No. 10). Prope pagum Bichki-Dere (jugum Kurmaly-Dagh), in faucibus humidis in cortice *Fagorum*, una cum *Thamnio alopecuro* et *Anomodo viticuloso*, ca. 300 m, (30. VI. — No. 18).

**Thamnium alopecurum* (L.) Bryol. eur. — Bithynia: circa Hendek, in valle Ibrik-Dere, solum humidum et truncos veteres obsidens, ca. 400 m, gregatim (31. I. — No. 20); ibidem, in declivi meridionali montis vallem Isak-Oglu-Dere versus, in querceto in solo, ca. 450 m

[1]) Determined Dr. B. Szafran (Lwów, Poland), revised Mr. J. Thériot (France).

(11. II. — No. 17); ibidem, in querceto partem septentrionalem truncorum obtegens, ca. 450 m, una cum *Homalothecio sericeo* (11. II. — No. 16); supra oppidulum Hendek, in fageto-carpineto montis Cham-Dagh (14. II. — No. 23). Prope pagum Bichki-Dere (jugum Kurmaly-Dagh), in faucibus humidis in cortice *Fagorum*, ca. 300 m (30. VI. — No. 19); ibidem, una cum *Anomodo viticuloso* (30. VI. — No. 28).

### Lembophyllaceae.

**Isothecium viviparum* (Neck.) Lindb. (= *I. myurum* [Poll.] Brid.) forma *camptocarpa* (Ther.?). — Bithynia: circa oppidulum Hendek, in valle Ulu-Dere, in trunco *Carpini Betuli* veteris, una cum *Neckera crispa*, ca. 370 m, (3. II. — No. 11).

### Thuidiaceae.

**Anomodon viticulosus* (L.) Hook. et Tayl. — Bithynia: circa Hendek, in valle humida Hussein-Sheikh-Dere, prope torrentem truncos arborum vivarum et collapsarum obsidens, ca. 430 m (4. II. — No. 13); ibidem, in declivi meridionali montis vallem Isak-Oglu-Dere versus, in querceto partem septentrionalem truncorum obtegens, una cum *Thamnio alopecuro* et *Homalothecio sericeo*, ca. 450 m (11. II. — No. 15). Prope pagum Bichki-Dere (jugum Kurmaly-Dagh), in faucibus humidis in cortice *Fagorum*, una cum *Neckera crispa* et *Thamnio alopecuro*, ca. 300 m, (30. VI. — No. 32).

### Amblystegiaceae.

**Drepanocladus uncinatus* (Hedw.) Warnst. — Paphlagonia: in declivitate septentrionali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m (28. VII. — No. 6).

### Brachytheciaceae.

*Homalothecium sericeum* (L.) Bryol. eur. — Bithynia: circa Hendek, in declivi meridionali montis vallem Isak-Oglu-Dere versus, in querceto, partem septentrionalem truncorum obtegens, una cum *Thamnio alopecuro* et *Anomodo viticuloso*, ca. 450 m, (11. II. — No. 33).

**Pleuropus euchloron* (Bruch) Broth. — Bithynia: in valle humida, nivis plena Su-Atak-Dere, ad radices *Fagi* (*Peltigera praetextata* implexus), prope torrentem, ca. 470 m (10. II. — No. 22).

*Brachythecium* sp. — Paphlagonia: supra oppidulum Tukht, in abieteto montis Panair-Tepe, ca. 1900 m (14. VII. — No. 25).

"Plante stérile appartient au groupe de *B. albicans, glareosum* etc. sans qu'on puisse l'identifier avec l'une ou l'autre de ces espèces."

**Brachythecium rutabulum* (L.) Bryol. eur. — Bithynia: circa Hendek, in valle humida Hussein-Sheikh-Dere, prope torrentem, truncis arborum vivarum et collapsarum haerens, una cum *Neckera crispa*, ca. 430 m (4. II. — No. 14).

### *Entodontaceae.*

***Pleurozium Schreberi* (Willd.) Mitt. — Paphlagonia: circa Edjevid, in declivitate boreo-occidentali collium, una cum *Dicrano scopario* var. *polycarpo*, ca. 1100 m (6. VIII. — No. 24).

### *Hypnaceae.*

*Hypnum cupressiforme* L. — Circa Byzantium: supra pagum Sari-Yar, in macchia solo haerens, alt. ca. 115 m (25. I. — No. 31). — Bithynia: circa Hendek, in valle Ulu-Dere, in trunco *Carpini Betuli* veteris, una cum *Neckera crispa*, ca. 370 m (3. II. — No. 27).

### *Rhytidiaceae.*

*Rhytidiadelphus triquetrus* (L.) Warnst. — Paphlagonia: in declivitate boreali montis Büyük-Ilgaz-Dagh, in abieteto, ca. 1700 m (28. VII — No. 4).

### *Polytrichaceae.*

*Catharinea undulata* (L.) Web. et Mohr. — Bithynia: circa Hendek, in valle umbrosa Hussein-Sheikh-Dere, in solo humido, ca. 430 m (4. II. — No. 1).

***Pogonatum aloides* (Hedw.) Palis. — Bithynia: circa Hendek, in valle Su-Atak-Dere, in fageto inter frutices *Rhododendrorum*, substrato argilloso (10. II. — No. 2).

**Polytrichum juniperinum* Willd.[1]). — Paphlagonia: supra vicum Djazoglu (inter Sinopen et Tashköprü), in cacumine montis Khadji-Aghach pineto circumdato, ca. 1760 m (1. VIII. — No. 3).

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[1]) Determined Dr. B. Szafran (Lwów, Poland), revised Mr. J. Thériot (France).

## Lichenes[1].

### *Cladoniaceae.*

*Cladonia silvatica* (L.) Hoffm. — Circa Byzantium: prope pagum Sari-Yar, in pariete praerupta doleritica, parce (25. I. — No. 5).

*Cladonia furcata* (Huds.) Schrad. var. *racemosa* (Hoffm.) Floerke. — Bithynia: circa Hendek, prope pagum Shekhlar, in macchia solo haerens, una cum *Cladonia rangiformi* var. *pungente*, ca. 191 m (7. II. — No. 8).

*Cladonia rangiformis* Hoffm. var. *pungens* (Ach.) Vain. — Circa Byzantium: supra pagum Sari-Yar, in macchia solo haerens, ca. 115 m (25. I. — No. 2). — Bithynia: circa Hendek, prope pagum Shekhlar, in macchia (*Arbutus, Erica, Cistus*), ca. 191 m (7. II. — No. 6).

*Cladonia fimbriata* (L.) Fr. f. *simplex* (Weis.) Flot. — Bithynia: circa Hendek, prope pagum Shekhlar, in macchia (*Arbutus, Erica, Cistus*), ca. 191 m (7. II. — No. 7).

*Cladonia alcicornis* Light.) Schaer. — Circa Byzantium: supra pagum Sari-Yar, in declivi Bosporum versus, in macchia solo haerens, alt. ca. 115 m (25. I. — No. 1).

### *Gyrophoraceae.*

*Umbilicaria pustulata* (L.) Hoffm. — Circa Byzantium: prope pagum Sari-Yar, in pariete praerupta doleritica, una cum *Cladonia silvatica*, copiose (25. I. — No. 3).

### *Stictaceae.*

*Lobaria linita* (Ach.) Vain. — Bithynia: supra oppidulum Hendek, in latere meridionali vallis Isak-Oglu-Dere, in querceto raro, in truncis crassulis *Arbuti Unedinis*, ca. 450 m, fr. (11. II. — No. 12). Infra, in alt. 370 m, haec species in cortice *Fagorum* (non lecta).

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[1]) The lichens have been determined by Dr. J. Motyka (Lwów).

## *Peltigeraceae.*

*Peltigera horizontalis* (Huds.) Baumg. — Bithynia: supra oppidulum Hendek, in valle humida, nivis plena, Su-Atak-Dere, prope torrentem ad radices *Fagi*, una cum *P. praetextata* et *Pleuropo euchloro*. ca. 470 m (10. II. — No. 10); ibidem, in monte Yilman (vallis Ulu-Dere), in querceto *Tilia argentea* admixta, solo haerens, ca. 425 m (25. VI. — No. 18).

*Peltigera praetextata* Zopf. — Bithynia: supra oppidulum Hendek, in valle nivis plena Su-Atak-Dere, prope torrentem ad radices *Fagi*, *Pleuropo euchloro* implexa, ca. 470 m, una cum praecedente (10. II. — No. 9).

## *Usneaceae.*

*Evernia prunastri* (L.) Ach. — Circa Byzantium: supra pagum Sari-Yar, in macchia ramis *Cistorum* (*C. salviifolius*, *C. villosus*) haerens, alt. ca. 115 m (25. I. — No. 4).

*Letharia* (*Evernia*) *divaricata* (L.) Hue. — Paphlagonia: in declivitate septentrionali montis Büyük-Ilgaz-Dagh, ramis *Abietis Nordmannianae* var. *leiocladae* haerens, ca. 1700 m (27. VII. — No. 21).

*Alectoria jubata* (L.) Ach. var. *prolixa* Ach. — Paphlagonia: in declivitate septentrionali montis Büyük-Ilgaz-Dagh, ramis *Abietis Nordmannianae* var. *leiocladae* haerens, ca. 1700 m, una cum praecedente (27. VII. — No. 20).

*Ramalina calicaris* (L.) Rohl. — Bithynia: supra oppidulum Hendek, in valle nivis plena Su-Atak-Dere, prope torrentem truncis *Fagorum* haerens, ca. 470 m (10. II. — No. 11).

*Ramalina farinacea* (L.) Ach. — Circa Byzantium: supra pagum Sari-Yar, in macchia ad ramulos *Cistorum*, una cum *Evernia prunastri*, alt. ca. 115 m (25. I. — No. 16).

*Usnea*[1]) *longissima* Ach. — J. Motyka, Lichenum generis *Usnea* studium monographicum, vol. II, 1937, p. 427. — Bithynia: circa Hendek, in monte Salman-Tepe, in fageto-querceto *Carpino Betulo* admixta, e *Carpinis* et *Fagis* pendens, in certis arboribus

[1]) At the time when Dr. Motyka received from me the Asia Minor materials for determination, the text of the labels had not yet been quite established, and was not written in Latin. Consequently his monograph on *Usnea*, where all my occurrences are quoted and the new forms and species described, in many cases gives the transcription of the Turkish geographical names incorrectly, and the text sometimes differs from the one given to the particular specimens in my work.

copiosissime, ca. 600 m (6. II. — No. 14); ibidem, in parte occidentali montium (Kurt-Dagh), in latere vallis Isak-Oglu-Dere, in querceto raro in ramis *Arbutorum* (11. II. — No. 24).

*Usnea florida* Hoffm. ssp. ***arbuscula*** Mot. — l. c. vol. I, 1936, p. 244. — Bithynia: circa Hendek, in valle umbrosa Ibrik-Dere, in fageto-querceto *Carpino* et *Castanea* admixtis, ca. 420 m, arboribus casa (1. II. — No. 22); ibidem, in valle Takhtalyk-Dere, in dumetis prope torrentem, ramos *Rhododendri pontici* obtegens, ca. 270 m (2. II. — No. 17).

***Usnea syriaca*** J. Motyka — l. c. vol. I, p. 278. — Bithynia: supra oppidulum Hendek, in valle umbrosa Ibrik-Dere, in fageto-querceto *Carpino Betulo* admixta, ca. 600 m, in solo lecta (1. II. — No. 13).

Dr. Motyka informs me that he has seen specimens of this new *Usnea* also from: Transylvania, Northern Serbia, and the Amanus mts. (Kotschy, Pl. Syriae bor. 40, in sylva *Abietum* ad pedes Akma-Dagh in Amano prope Beilan). The presence of *Usnea syriaca* in Bithynia, on the one hand, and in the Amanus mts. on the other suggests that the age and distributional history of this species is, perhaps, the same as of *Rhododendron ponticum, Rh. flavum, Hedera colchica. Fagus orientalis* and some others, which species after a gap covering the whole of Central Anatolia are to be found again in the Taurus, Antitaurus, Amanus or Lebanon mts.[1]).

***Usnea Czeczottiae*** J. Motyka — l. c. vol. I, p. 138. — Paphlagonia: in declivi septentrionali montis Büyük-Ilgaz-Dagh, in abieteto. ca. 1700 m (28. VII. — No. 23).

***Usnea anatolica*** J. Motyka — l. c. vol. I, p. 140. — Bithynia: circa Hendek, in latere ad meridiem vergente vallis Isak-Oglu-Dere (Kurt-Dagh), in transitione silvae *Fagorum* et *Quercorum*, e ramis *Arbuti Unedinis* dependens, ca. 450 m (11. II. — No. 19); ibidem, in valle Takhtalyk-Dere, inter dumeta *Rhododendrorum*, ca. 270 m (2. II. — No. 25).

***Usnea bithynica*** J. Motyka — l. c. vol. I, p. 139. — Bithynia: circa Hendek, in valle Takhtalyk-Dere. inter frutices *Rhododendri pontici*, ad torrentem, ca. 270 m (2. II. — No. 15).

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Another mistake which crept into the above-mentioned monograph is this: the type-specimens of the *Usnea* described by Dr. Motyka after my specimens are in my private herbarium (Warsaw), not, as stated by him, in the Physiographical Museum of the Polish Academy of Sciences in Cracow, where only their duplicates, as of all my Asia Minor collection, are to be found.

[1]) Compare: Czeczott, 17, p. 373, and 18, maps in figs: 4, 7, 8, 10—13.

Dr. Motyka's general remark[1]) on my small collection of lichens runs as follows: "As concerns the lichens inhabiting the soil they are present also in Central Europe. This is quite comprehensible, for they are cosmopolitan or have, at any rate, very large distributional areas. The finding of *Peltigera horizontalis* at such a low altitude is interesting, for this species is peculiar to the higher mountains.

The distribution of the only species found on a rocky substratum — of *Umbilicaria pustulata* — is remarkable: though common in Western Europe, it is absent in its central part (for instance in the Western Carpathians), and then it reappears in the East.

Among lichens inhabiting trees in the foliferous forests the abundance of new species and forms of the genus *Usnea* is striking. Besides *Usnea longissima*, widely distributed in mixed and purely coniferous forests of the Holarctis, we find here species that were hitherto quite unknown, but which are closely related to the species of beechwoods of the Central and Western Europe.

Lichens peculiar to coniferous forests are poorly represented. A noteworthy feature is the joint occurrence of *Letharia divaricata* and *Alectoria jubata* var. *prolixa* on *Abies Nordmanniana* var. *leioclada* and at such a considerable altitude. In Europe both these species are restricted to *Picea*-forests."

[1]) Translated from the original Polish into English by the present writer.

# Fungi[1].

### *Xylariaceae.*

*Xylaria polymorpha* (Pers.) Grev. — Bithynia: circa Hendek. in valle umbrosa Hussein-Sheikh-Dere, in fageto-carpineto, in trunco putrido prope torrentem, ca. 430 m (4. II. — No. 1).

### *Pezizaceae.*

*Geopyxis Catinus* Holmsk. — Bithynia: circa Hendek, in valle umbrosa Hussein-Sheikh-Dere, in fageto-carpineto, in ramis caducis in aqua torrentis, ca. 430 m (4. II. — No. 3).

### *Polyporaceae.*

*Polystictus pergamenus* Fr. — Bithynia: circa Hendek, in valle umbrosa Hussein-Sheikh-Dere. in fageto-carpineto, in solo lectus (4. II. — No. 4).

*Daedalea quercina* (L.) Pers. — Bithynia: circa Hendek, in valle Isak-Oglu-Dere, in fageto rhododendroso. in solo lecta (11. II. — No. 5).

### *Calostomataceae.*

*Astraeus stellatus* (Scop.) Morg. — Bithynia: circa Hendek, in valle umbrosa Hussein-Sheikh-Dere, in fageto-carpineto. prope torrentem solo humido haerens, ca. 430 m (4. II. — No. 2).

[1]) The fungi have been determined by Prof. Dr. F. Siemaszko (Warsaw).

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In conclusion, my sincere thanks are due to Prof. Dr. Friedrich Fedde of Berlin-Dahlem for having undertaken to bring out my book. I am deeply obliged to him for the great care he has bestowed upon its publication.

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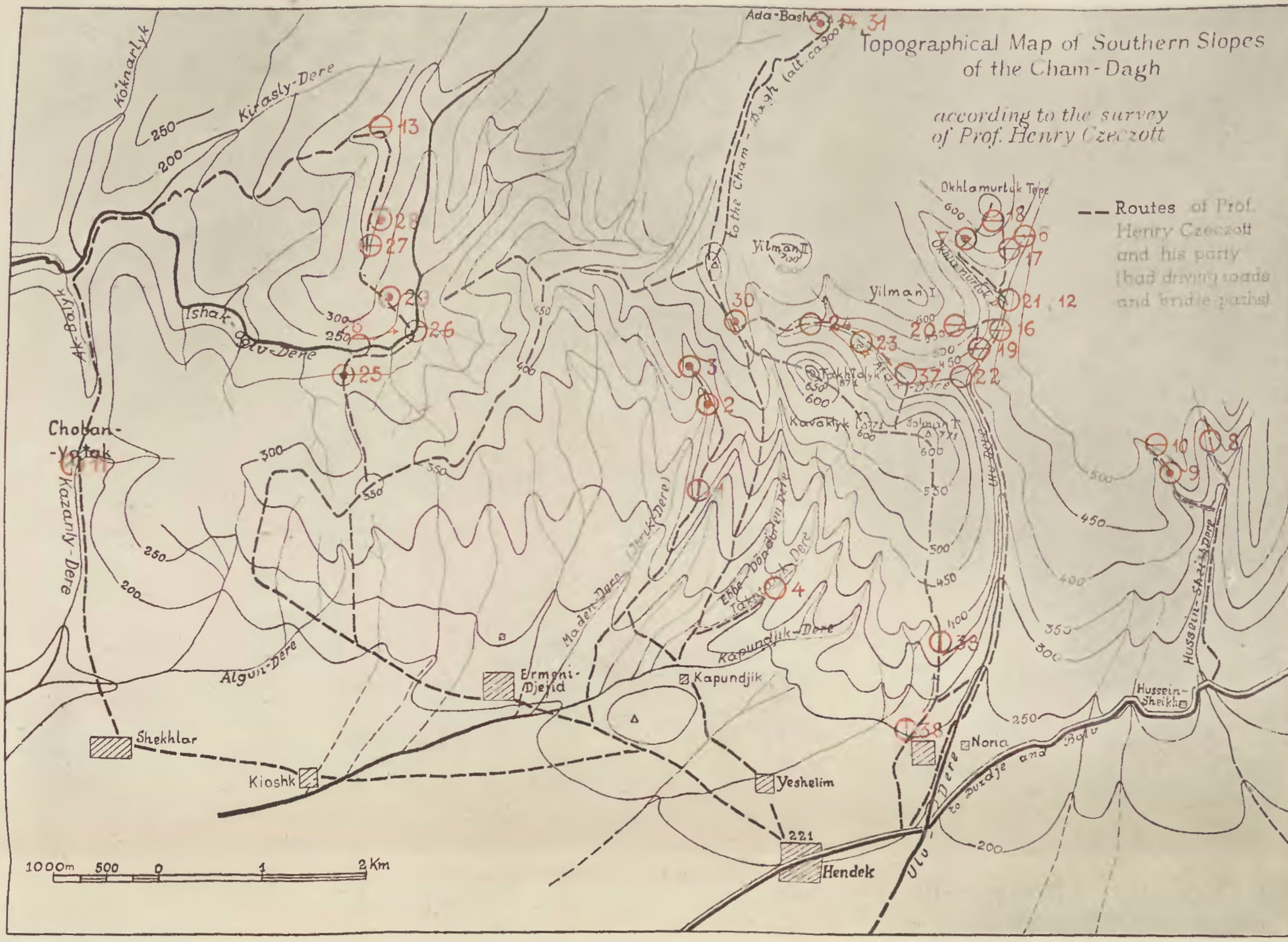
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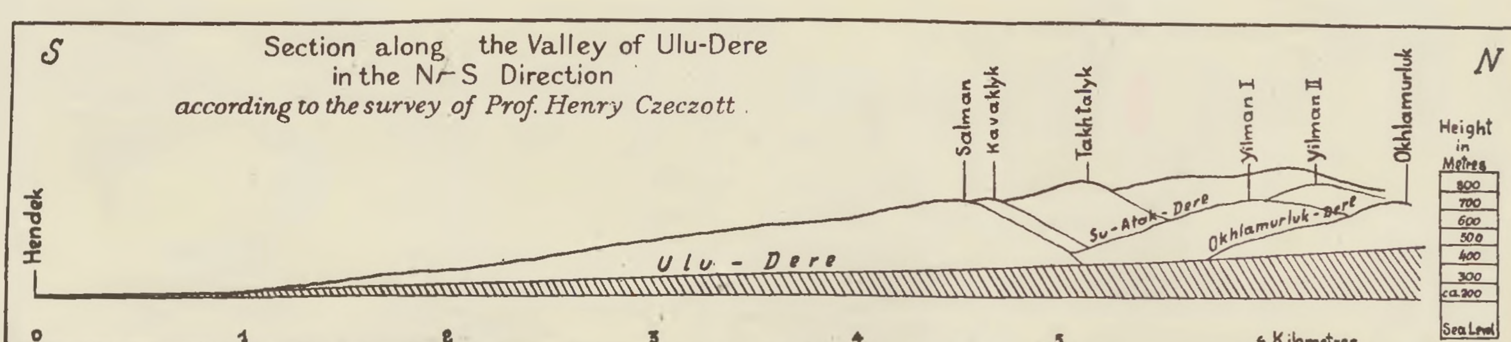
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## ALPHABETICAL INDEX OF FAMILIES.




Figures denote the numbers of records in tables I—IV.

- ⊙ Beech-woods
- ⊖ Oak-woods
- ○ Vegetation of the bottom of valleys
- ⦶ Brushwood communities




1. Map of Southern Slopes of the Cham-Dagh (Bithynia).




2. Map of North-Western Asia Minor.

Red line denotes the route taken by Prof. H. Czeczott's expedition.



Phot. Henry Czeczott.

Phot. 1. General view of mountains near Hendek (Cham-Dagh, Bithynia). In the foreground - macchie with *Erica arborea* and *Arbutus Unedo*. In the background deciduous forests. See p. 4.



Phot. Hanna Czeczott.

Phot. 2. Waterfall in winter in the valley of Su-Atak Dere. In spite of the snow the whole of the vertical wall is covered with green herbs and ferns. See pp. 4 and 26.



Phot. Henry Czeczott.

Phot. 3. Winter aspect of the valley Ulu-Dere. In the background the imposing chain of KardOz-Yalla (1800 m). See pp. 5 and 10.



Phot. Henry Czeczott.

Phot. 4. Summer aspect of the beautiful valley of Ulu-Dere. Slopes covered with deciduous forests (beech, hornbeam, silver lime-tree, oak). On the left - a terrace. On the right - the stream which has cut its bed much deeper. See pp. 5 and 10.



Phot. Henry Czeczott.

Phot. 5. Grove of oaks in the lower zone (200 m) of the Cham-Dagh near Hendek. In the foreground - bulfalos, the principal animal for work in Northern Anatolia. See p. 6.



Phot. Hanna Czeczott

Phot. 6. One of the huge *Platanus orientalis* trees - characteristic tree of the river valley in Northern Anatolia. In the foreground - Prof. Czeczott (right) and Prof. Nikitin (left). Ulu-Dere, altitude about 250 m. See p. 7.



Phot. Hanna Czeczott.

Phot. 7. Winter aspect of the beech forest on the crest of Ada-Basha (near the summit of Cham-Dagh). Undergrowth lacking. In the ground stratum abundant plants of *Rubus* spp. and *Festuca montana*, both retaining their green leaves even at this season of the year. Altitude 850 m. See pp. 17, 21 and 35.



Phot. Hanna Czeczott.

Phot. 8. Summer aspect of the beech forest on the slope to the valley of Isak-Oglu-Dere. Şaplings and seedlings found in abundance. *Rhododendron ponticum* absent. Altitude 366 m. See pp. 17 and 20.



Phot. Hanne Czeczott.

Phot. 9. Magnificent virgin forest of beech in winter with an undergrowth of *Rhododendron ponticum* on the slope to the valley Su-Atak-Dere. *Hedera colchica* climbs to the top of the trees. Altitude 553 m. See pp. 18, 19 and 21.



Phot. Henry Czeczott.

Phot. 10. Winter aspect of the beech woods on the slope of Yilman. Taken from the slope of the Okhlamurluk, where oak woods, with the undergrowth of *Erica arborea* and *Arbutus Unedo*, prevail. Altitude 520 m. See p. 11.



Phot. Henry Czeczott.

Phot. 11. Winter aspect of stream-woodland, consisting of hornbeam, chestnut-tree and beech, in the narrow valley of Isak-Oglu-Dere; dense undergrowth of *Prunus Laurocerasus* and *Rhododendron ponticum*. Altitude about 250 m. See p. 28.



Phot. Henry Czeczott.

Phot. 12. Summer aspect of the same locality. Near the water is seen (in the centre) a society of *Petasites officinalis* and *Datisca cannabina* - owing to the shade slightly developed. See pp. 19 and 28.



Phot. Hanna Czeczott.

Phot. 13. *Petasites-Datisca* society in the open space in the beech-woods along the bank of the stream of Su-Atak-Dere. *Petasites* surpass here the height of a tall man (there is one standing among the leaves - in the centre). Altitude 460 m. See pp. 26 and 29.



Phot. Hanna Czeczott.

Phot. 14. A fragment of *Petasites-Datisca* society in the same valley, with a Turk standing under the leaves. Su-Atak-Dere. Altitude about 475 m. See pp. 26 and 29.



Phot. Henry Czeczott.

Phot. 15. Stream-woodland in the upper part of the valley Su-Atak-Dere. Under the dense canopy of the crowns of *Fagus orientalis* neither tall herbs *(Petasites, Datisca)* nor other trees can grow. Only *Prunus Laurocerasus* and ferns persist. Altitude 520 m. See pp. 19 and 29.



Phot. Hanna Czeczott.

Phot. 16. Pine-woods on the north-western slope of the Cham-Dagh. Two species of pine are present: *Pinus nigra* var. *Pallasiana* and *Pinus silvestris* var. *subalpina*. Altitude about 745 m. See p. 35.



Phot. Hanna Czeczott.

Phot. 17. General view of Ankara - capital of Turkey. To the left - old citadel.
See p. 50.



Phot. Henry Czeczott.

Phot. 18. General view of the country around Ankara from the citadel mount.
See p. 50.



Phot. Hanna Czeczott.

Phot. 19. Highland landscape between Ankara and Changri. Vegetation - steppes; dots represent trees of *Pirus elaeagrifolia*, considered by many as the ancestors of some species of pear-trees. See p. 53.



Phot. Henry Czeczott.

Phot. 20. View of a highland landscape in the Central Anatolia (between Ankara and Tukhl) taken from the slope of Bokly-Tepe. The shrub region distinctly seen on the slopes of the nearest mountains. The solitary tree (misshaped by man) testifies to the nearness of the forest region. Altitude about 1400 m. See p. 59.



Phot. Henry Czeczott.

Phot. 21. A solitary pine *(Pinus nigra var Pallasiana)* in the transitional region between steppes and forests. In the far distance - Miocene plains of gypsaceous marls of the district of Changri. See p. 59.



Phot. Hanna Czeczott.

Phot. 22. The fir-tree *(Abies Nordmanniana var. leioclada)* on the summit of Panair-Tepe at the boundary between steppe- and forest region in Northern Anatolia. On the horizon - slightly visible chain of Ilgaz-Dagh (Olgassys). See p. 62.



Phot. Henry Czeczott.

Phot. 23. The town of Arab with the scrub-steppe in the foreground, covering stony soil. See pp. 65 and 71.



Phot. Hanna Czeczott.

Phot. 24. The town of Arab. In the background the almost bare mountains belonging to the system of Eldiven-Dagh. See p. 71.



Phot. Henry Czeczott.

Phot. 25. The pioneer-pines *(Pinus nigra* var. *Pallasiana)* on the boundary between steppe- and forest region, on the slope of Eldiven-Dagh. The trees are very much spoiled by the hand of man. See p. 71.



Phot. Hanna Czeczott.

Phot. 26. Vegetation along the winding river course of the Devrez-Chal. Composition: *Populus euphratica, Elaeagnus hortensis, Hippophaë rhamnoides, Salix etc.* See p. 75.



Phot. Henry Czeczott.

Phot. 27. The valley of Ilgaz-Su (in the southern part of the mountain-chain Ilgaz-Dagh). All slopes facing the south are covered with steppe-vegetation, while those facing north have pine-woods *(Pinus nigra* var. *Pallasiana)*. See pp. 75 and 90.



Phot. Henry Czeczott.

Phot. 28. A varied landscape in the valley of Ilgaz-Su. The slopes are worked out by erosion. See pp. 76 and 78.



Phot. Hanna Czeczott

Phot. 29. The hamlet of Yailajik in the valley of Ilgaz-Su. Dome-like summit in the background - Kush-Kayasy, 2200 m. At the lower left - our camp. See pp. 77 and 78.



Phot. Hanna Czeczott.

Phot. 30. Grove of *Pirus elaeagrifolia* on the slope of Kush-Kayasy. Tha farthest summit in the background - Büyük-Ilgaz-Dagh. See p. 79.



Phot. Henry Czeczott.

Phot. 31. *Abies Nordmanniana* var. *leioclada* on the slope of Kush-Kayasy, altitude 1940 m; farther on - sparse tree vegetation denotes the zone of transition between steppes and forests. The chain of Kush-Dagh is seen in the distance. See pp. 79 and 80.



Phot. Hanna Czeczott.

Phot. 32. The transition from subalpine forest *(Abies Nordmanniana)* to alpine vegetation. The northern slope of Kush-Kayasy. In the foreground - dense shrubs of *Juniperus nana*. Altitude about 2100 m. See p. 80.



Phot Henry Czeczott

Phot. 33. Fir-forest on the slope of Büyük-Ilgaz-Dagh (shortly before the pass) View backwards - to the valley of Ilgaz-Su. To the right, on densely wooded slope, the road Ankara-Ineboli is seen. Altitude about 1800 m. See p. 83.



Phot. Henry Czeczott.

Phot. 34. Rich forest of *Abies Nordmanniana* var. *leioclada* with intermixture of *Pinus silvestris* (in the right foreground) on the slopes of Büyük-Ilgaz--Dagh. See p. 83.



Phot. Henry Czeczott.

Phot. 35. Pine-trees *(Pinus nigra* and *Pinus silvestris)* near the summit of Büyük-Ilgaz-Dagh. The surface is very uneven on account of the presense of glacial boulders and moraines (? in the left background). Altitude about 2000-2100 m.
See p. 85.



Phot. taken from Leonhard's „Paphlagonia"

Phot. 36. General view of Büyük-Ilgaz-Dagh from the road connecting Ankara with Ineboli. The whole slopes are covered with dense virgin mixed or fir-forests.
See pp. 87 and 91.



Phot. Hanna Czeczott.

Phot. 37. The valley of Balyk-Deressi with the view on Büyük-Ilgaz-Dagh. from the north. The slopes are covered with thick shrubs of beech *(Fagus orientalis)*. See p. 95.



Phot. Henry Czeczott.

Phot. 38. Our camp near the hamlet of Djazoglu in the region of shrub-communities, here consisting of several species of oaks *(Quercus cerris, Q. infectoria, Q. crispata)*. In the foreground - wild pear-tree. See pp. 99 and 100.



Phot. Henry Czeczott.

Phot. 39. A beautiful virgin forest of *Pinus nigra* var. *Pallasiana* with an undergrowth of *Cistus laurifolius* on the slope of Khadji-Aghach. Altitude about 1340 m. See p. 102.



Phot. Henry Czeczott.

Phot. 40. Looking north into the valley of Üsünös-Dere and towards the Black Sea, which on account of the fog is indistinguishable, from the pass (1200 m) between Edjevid and Küre. The town of Küre is visible in the valley. See p. 110



Phot. Henry Czeczott.

Phot. 41. Remarkably rich mixed forests on the slopes of the valley Alma-Dere near the road connecting Ankara with Ineboli. Altitude about 700 m. See p. 116.



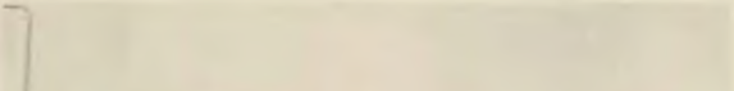
Phot. Henry Czeczott.

Phot. 42. Sea town of Ineboli. The highest mountains in the background are invisible on account of the mist. See p. 118.



Phot. Henry Czeczott.

Phot. 43. Huge waves caused by the northern wind, preventing the steamers from approaching the shore (Ineboli). See p. 118



Phot. Henry Czeczott.

Phot. 44. Rough sea leaving behind much wood along the beach which the poor gather up (Ineboli). To the left - steep rocky shore. In the foreground - members of Prof. Czeczott's expedition: Prof. Nikitin (right), the late Zawadzki (left), the author. See p. 118.



Phot. Hanna Czeczott.

Phot. 45. Typical view of macchie on the rocky shore of the Black Sea (Zunguldak). See p. 121.



Phot. Murat-Aziz

Phot. 46. High macchie on limestone rocky shore of the Black Sea near Zunguldak. Right: *Erica arborea*, in the foreground *Arbutus Unedo*. *Tamus communis* and *Smilax excelsa* entwine the shrubs. See p. 121.



Taken from a postcard

Phot. 47. General view of the island of Prinkipo as seen from above Khalki (another island with the town of the same name in the group of Princes Isles). In the foreground a plantation of olive trees. See p. 134.



Phot. Tad. Wiśniewski.

Phot. 48. *Pinus Brutia* wood on the island of Prinkipo (Marmara Sea). See p. 134.



Phot. Henry Czeczott.

Phot. 49. *Pinus Brutia* Ten. on the Island of Prinkipo (Marmara Sea). See p. 134.



Phot. Henry Czeczott.

Phot. 50. Macchie in the south-western part of Prinkipo Island. See p. 135.



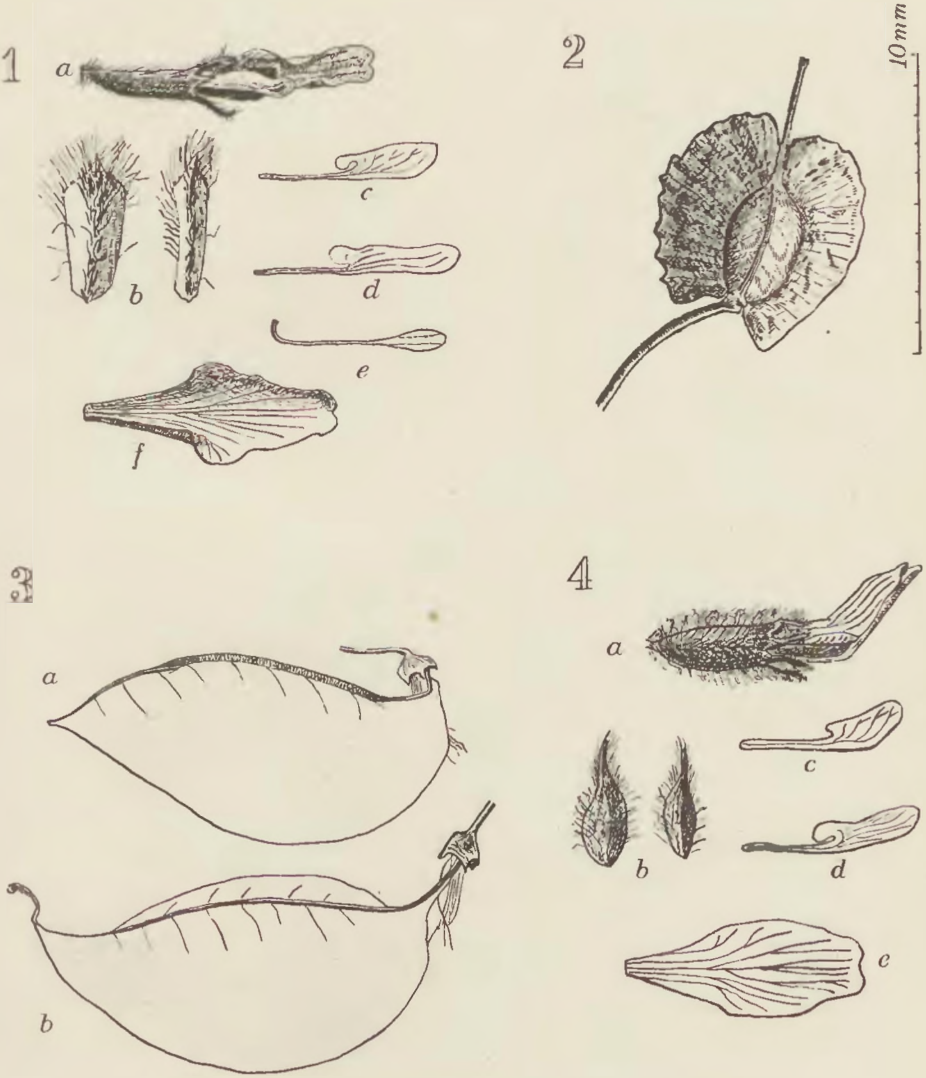
Phot. Hanna Czeczott.

Phot. 51. View of the Bosporus from above Rumeli-Kavak. Slopes densely covered with macchie. Ruins in the centre - the remains of a Byzantine fortress and wall (having its continuation on the Asiatic coast of Bosporus). Near it - on denuded slope - *Calluna vulgaris* occurs. See p. 129.



Phot. Hanna Czeczott.

Phot. 52. The famous grove of *Cupressus pyramidalis* on the cemetery of Eyub near Constantinople. In the background - below - the Golden Horn, in the misty distance - the capital is hardly seen. See p. 135.




del. Hanna Czeczott.

Fig. 1. *Astragalus ilgazensis* Cz.: a, flos; b, bracteae; c, carina; d, ala; e, ovarium cum stylo; f, vexillum. — About twice natural size

Fig. 2. *Aethionema paphlagonicum* Cz.: fruit (capsule). 4 times nat. size.

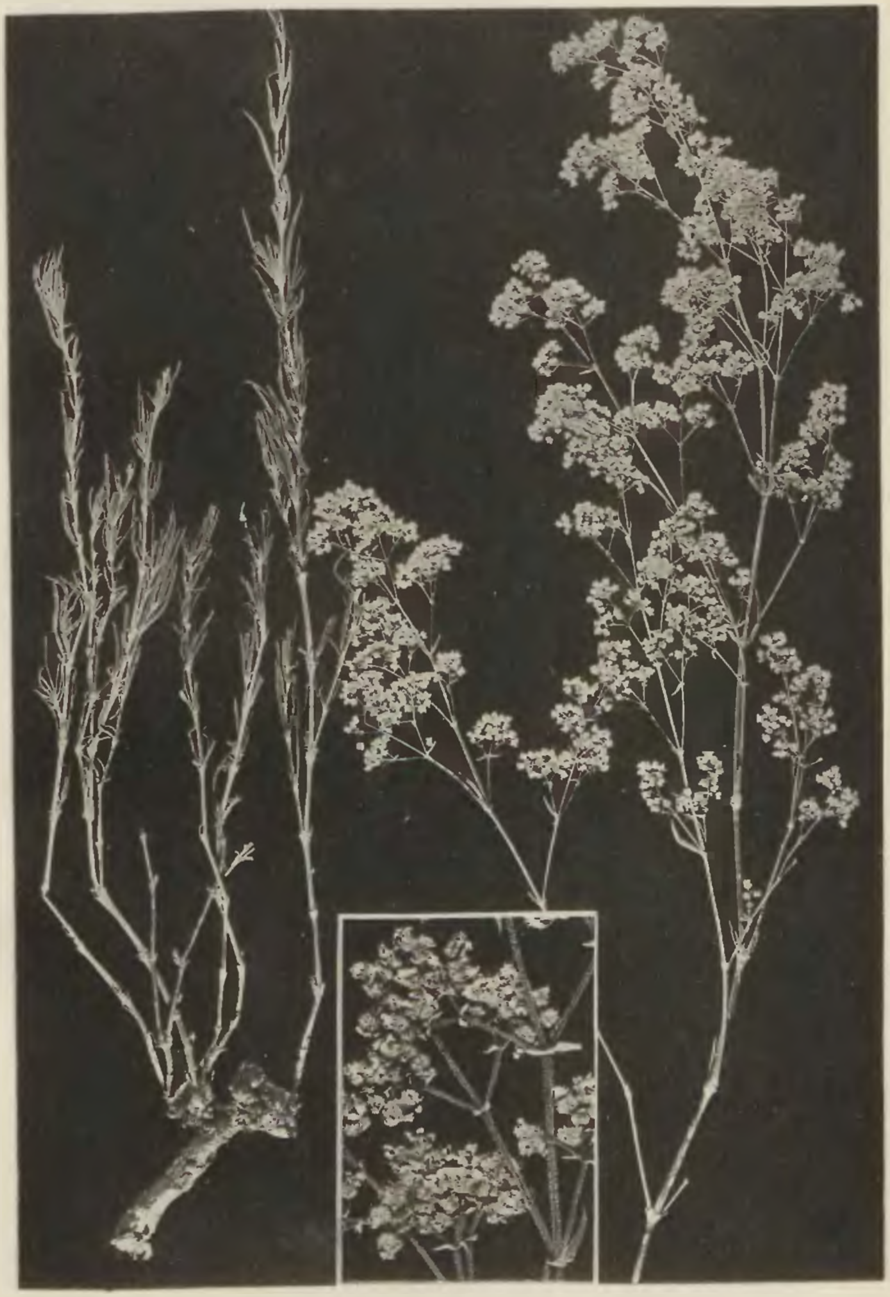
Fig. 3. a (upper figure) *Colutea cilicica* Boiss. et Bal.: b (lower figure) *Colutea arborescens* L. — About four fifth natural size.

Fig 4. *Astragalus Nabelekii* Cz.: a, flos; b, bracteae; c, carina; d, ala; e, vexillum. — About twice natural size.




Phot. J. Lilpop and H. Czeczott.

Fig. 1a. *Dianthus ilgazensis* Cz. About [illegible] nat. size. Fig. 1b. Flowers Nat. size.
Fig. 2. *Dianthus eldivenus* Cz. About [illegible] nat size.



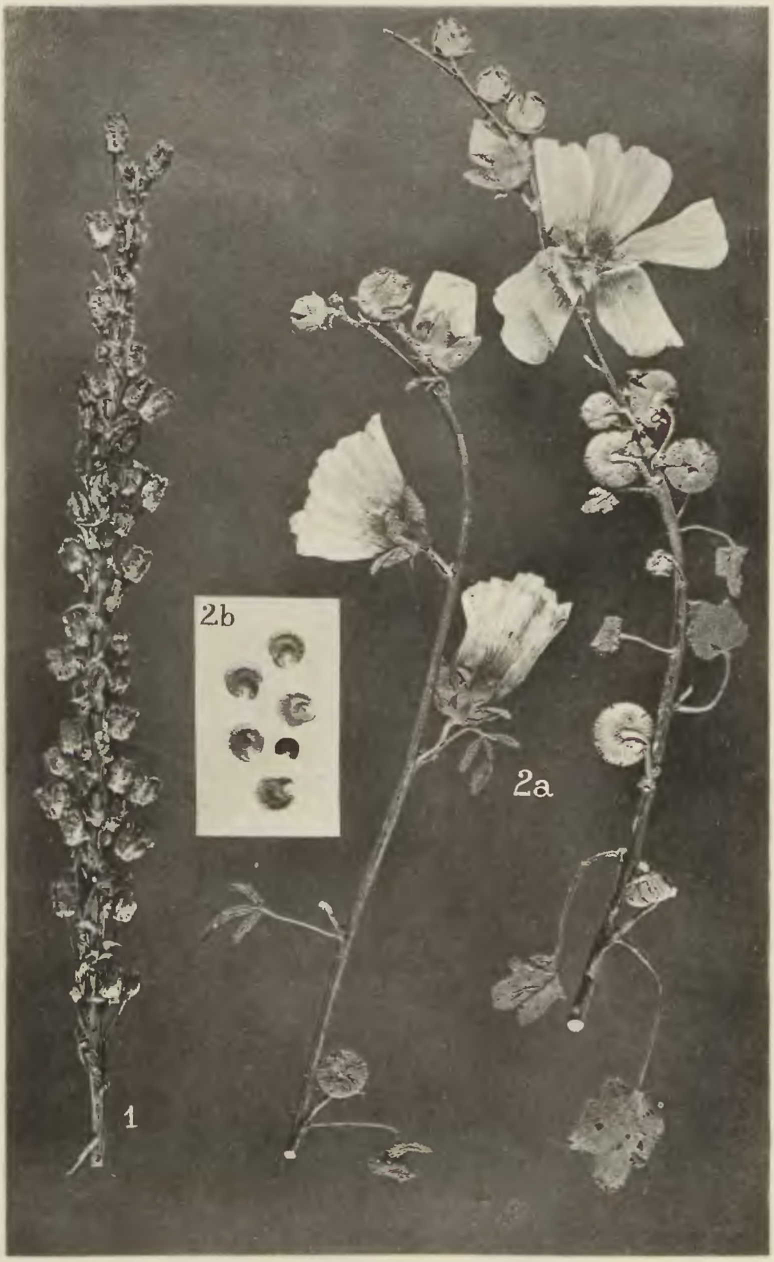
Phot. J. Lilpop and H. Czeczott.

*Gypsophila Henrici* Cz. About [illegible]/5 nat. size. In the frame flowers. Natural size.




Phot. J. Lilpop and H. Czeczott.

Fig. 1. *Paronychia anatolica* Cz. Nat. size.
Fig. 2. *Paronychia Beauverdi* Cz. Nat. size.




Phot. J. Lilpop and H. Czeczott.

Fig. 1. *Asphodeline Wiedemanniana* Cz. $^{2}/_{5}$ nat. size.
Fig. 2a. *Althaea rugoso-stellulata* Cz. $^{2}/_{5}$ nat. size.
Fig. 2b. Its Fruits and seed. Nat. size.




Phot J. Lilpop and H. Czeczott.

Fig. 1. *Asyneuma eldivenum* Cz. About 1/2 nat. size.

Fig. 2a. *Lathyrus tukhtensis* Cz. About 1/2 nat. size. 2b. Its flowers, nat. size.

Fig. 3. *Alchemilla acutiloba* Stev. ssp. *amoena* Cz. About 1/2 nat. size.



Phot. J. Lilpop and H. Czeczott.

*Smyrnium galaticum* Cz. About [illegible] nat. size.



Phot. J. Lilpop and H. Czeczott.

*Heracleum paphlagonicum* Cz. About $^2/_5$ nat. size.




Phot. J. Lilpop and H. Czeczott.

Fig. 1. *Onosma Briquetii* Cz. About $^2/_3$ nat. size.

Fig. 2a. *Centaurea Czeczottiae*. About $^2/_3$ nat. size. Fig. 2 b. Seeds, nat. size.



Phot. J. Lilpop and H. Czeczott.

*Scorzonera nutans* Cz. Natural size.

Phot. J. Lilpop and H. Czeczo







Fig. 1. *Quercus colchica* (Ky.) Cz. (exsiccata No. 502) Fig. 2. *Quercus polycarpa* Schur. (exsiccata No. 461)

Two shrub-oaks which play an important part in Northern Paphlagonia where they occur as the undergrowth of pine-forests or as independant brushwoods. Note the striking dissimilarity of the leaves. Natural size.




Phot. J. Lilpop and H. Czeczott.

Four different forms of *Quercus cerris* L. met with near the village of Djazoglu (Paphlagonia: between Sinope and Tashköprü): a, forma *subconferta* Cz. exs. No. 386; b, forma *haliphloes* Schneider; c, forma *incisissima* Cz. exs. No. 505; d, var. *typica* Loud. Slightly reduced.



Phot. J. Lilpop and H. Czeczott.

*Iris longepedicellata* Cz. About $^2/_5$ nat. size.